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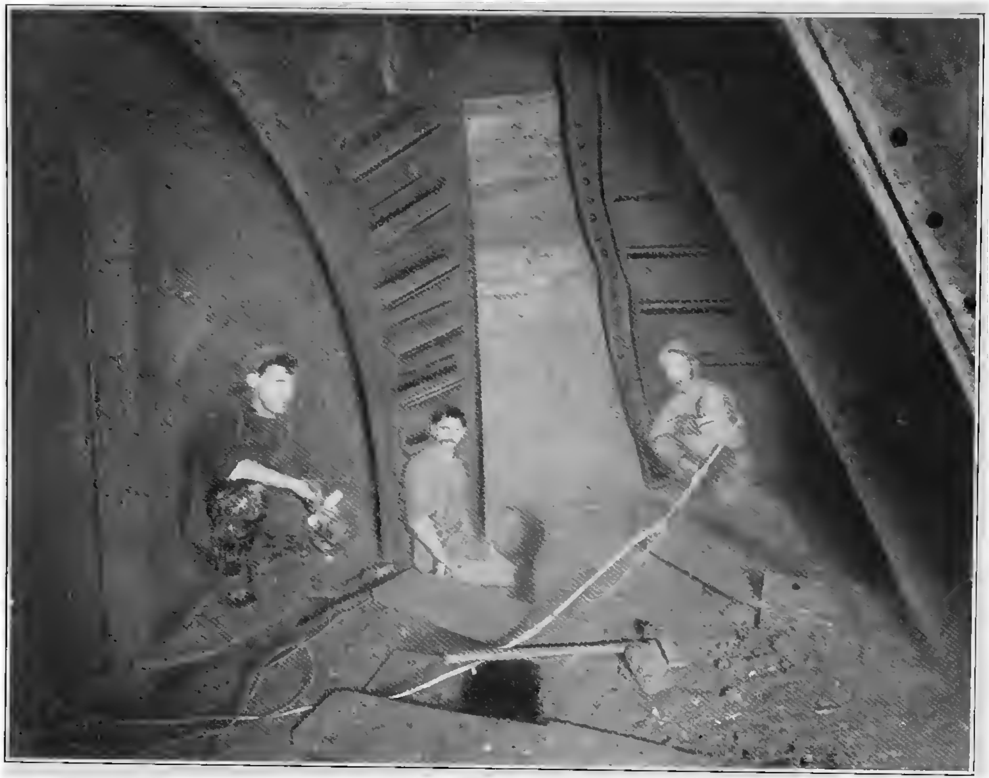

Meeting of East River Tunnel Shields, December 14, 1906, Connecting the Boroughs of Manhattan and Brooklyn.

REPORT

OF THE

BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS

FOR THE CITY OF NEW YORK

FOR THE

Year Ending December 31, 1906

ACCOMPANIED BY REPORTS

OF THE

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AND OF THE

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REPORT

OF THE

COMISSIONERS

WITH APPENDICES

OFFICE OF THE

Board of Rapid Transit Railroad Commissioners

No. 320 Broadway, New York,

January 1, 1907.

To the Mayor of the City of New York.

Sir—The Board herewith transmits its report for the year 1906.

On the 1st of January Mr. Grout's term of office as Comptroller expired, and Mr. Herman A. Metz, his successor, took his seat in the Board.

Under date of April 19, 1906, Mr. John Claflin resigned, to the great regret of his fellow members of the Board. His place was filled by the appointment of Mr. Lewis Cass Ledyard, who in turn found himself compelled to retire in consequence of the large demands upon his time, and presented his resignation on December 22, 1906.

There have been no changes in the staff of the Board except in some minor positions.

I.

FUTURE RAPID TRANSIT.

The year 1906 was not signalized by the beginning of construction of any new rapid transit railways, nor even by the letting of any contracts for such construction; but very great progress was made in obtaining the essential constitutional authority without which no street railways can be built.

It seems to be often forgotten, even by those who have publicly discussed the subject, that the Constitution of this State prohibits the building of any railway on a street,—whether a surface road, an elevated road, or a subway,—"except upon the condition that the consent of the owners of one-half in value of the property bounded on, and the consent also of the local authorities having the control of that portion of a street or highway upon which it is proposed to construct or operate such railroad, be first obtained, or, in case the consent of such property owners cannot be obtained, the Appellate Division of the Supreme Court, in the Department in which it is proposed to be constructed, may, upon application, appoint three Commissioners, who shall determine, *after a hearing of all parties interested,* whether such railroad ought to be constructed or operated, and such determination, confirmed by the court, may be taken in lieu of the consent of the property owners."

To obtain such consents in the City of New York is always a task involving an enormous mass of wearisome detail; and in the case of the routes adopted by the Rapid Transit Board in 1905, the time was greatly prolonged by certain exceptional circumstances. In the first place, the City lies within two separate Judicial Departments, so that in the case of every route crossing the East River two applications to the Courts are necessary,—if the consent of owners cannot be obtained,—thus involving the appointment of two sets of Commissions and practically doubling the work. In the second place, doubts as to the constitutionality of the legislation of 1905, transferring the control of the streets from the Aldermen to the Board of Estimate and Apportionment, led to a delay of about four months in the appointment of Commissioners in the First Judicial Department.

And finally, the fundamental conditions of the rapid transit problem are such as inevitably to invite the opposition of property owners to every plan which promises extensive relief. The rapid transit situation can never be dealt with in a large way except by railways which will bring passengers to the places where their daily business is carried on; that is to say, in nine cases out of ten, to the lower part of Manhattan. In this locality the streets are crooked, and often comparatively narrow. The value of property is generally extremely high. The necessity for easy and cheap transportation to the outlying parts of the City does not appeal to the selfish interests of property owners. And therefore,—while it has generally been easy to secure the requisite consents in Queens, The Bronx and Brooklyn,—in Manhattan it has always proved impossible, in the case of any extended rapid transit road, to obtain voluntary consents, and applications to the Court are frequently opposed. In three such cases, this Board has had to encounter the most earnest and prolonged opposition to its plans.

At the close of the year 1906, all these difficulties had been substantially overcome. If no new conditions shall hereafter arise,—either through legislation or otherwise,—the people of this City may now look forward with the greatest confidence to an early commencement of construction of the comprehensive system laid out by this Board in 1905. Without long sustained effort, it must always be impossible to build any adequate system for passenger transportation; but the preliminary work of this Board is now, in all essential particulars, complete, and those who are entrusted with carrying on the task may henceforward devote themselves to the physical work of construction.

The history of the efforts to procure real rapid transit in the City of New York, which extends now over a period of more than thirty years, is instructive as to the legal and financial obstacles which lie in the way of any scheme of betterment.

As early as 1875 a Rapid Transit Law was passed, which provided for the appointment from time to time of commissions to deal with the subject. Under this Act, a large part of the present elevated railroad system in Manhattan and The Bronx was laid out and constructed. This method of dealing with the subject piecemeal proved unsatisfactory, and in 1891 an Act was passed creating a permanent Commission. The theory of that Act was, that the Commissioners should lay out a railroad and sell in perpetuity a franchise to construct, maintain and operate it. A great deal of work was done by this Commission, which laid out a subway route under Broadway, obtained the consent of the local authorities and the Supreme Court, and offered the franchise for sale to the highest bidder on December 29, 1892. Fortunately, as it has since turned out, the only bid for the franchise was the sum of One thousand dollars, which bid the Commission rejected. The work of this Commission, however, did not go for nothing, for it resulted in the accumulation of a great mass of information, which has since proved of the utmost value, and its reports went far towards overcoming doubts as to the possibility of underground railroads in this City.

Soon after the failure of the Commission of 1891 to provide for the building of a railroad, Mr. Richard T. Wilson came forward with the suggestion that he would take the franchise and build the road on the terms proposed, provided the City would advance a large percentage of the necessary funds at a moderate rate of interest. It was apparent that this suggestion could not be complied with under the Constitution of the State of New York; but it led to the adoption of a plan somewhat similar in effect, which was proposed by Mr. Abram S. Hewitt and supported by the Chamber of Commerce. The essential features of this plan, as enacted in 1894, were that the City itself should build and own any rapid transit railroad thereafter built; but that in order to insure economy, thoroughness and rapidity in construction, the contractor should be required also to agree to take a lease of the railroad and equip and operate it for a term of years. A further provision of this law was that it should be submitted to a vote of the people at the election to be held in November, 1894.

The popular vote having been very strongly in favor of municipal ownership as proposed, the Rapid Transit Commission immediately set to work and adopted a route which was approved by the local authorities in 1895. The Supreme Court, however, by a decision rendered on May 22, 1896, unanimously refused to approve the route. The Court held that the probable cost of the road would be mere conjecture, and spoke of the probability that "financial difficulties will be met and the construction of this road will drag its weary length along for a time which no man can compute, and possibly its construction be absolutely abandoned because of the wreck of the City's finances and the intervention of constitutional prohibition." It was suggested that the Rapid Transit Commissioners might "involve the City in an amount of obligation which would absolutely ruin and destroy its credit, and bring about as great a disaster as was occasioned by the collapse of the Panama Canal."

At about the same time a very strong effort was made to have the Act declared unconstitutional, on the ground that such a law was in violation of the Constitution; that it was "pernicious, wantonly extravagant and dangerous, and that it tended to foster socialism and paternalism, and was a departure from our principles of Government which had never before found favor." Upon this point the Court of Appeals was divided, but a majority of the Court held that the exceptional conditions in the City of New York justified a departure from what should be the ordinary policy of the State. "Our Government," said the prevailing opinion, "was established by the people for their own protection and welfare. Their policy was to foster and protect individual industry and enterprise. To such policy we owe our advancement as a nation, and to such we must look for our future prosperity. *The Constitution should be construed with reference to this general policy, and, ordinarily, railroads should be constructed and operated by private capital."*

Notwithstanding these discouraging declarations by the Courts and the opposition of many influential citizens, who conscientiously believed that an underground road would prove impracticable, the Rapid Transit Commission persevered, and in 1897 adopted the modified route upon which the present subway is built north of the Brooklyn Bridge. It was approved by the municipal authorities, in spite of a strong dissenting vote in the Common Council, and it was reluctantly approved, after very serious opposition, by the Supreme Court. The Court, however, thought it proper to require the practically prohibitory condition that a continuing bond in the penalty of Fifteen million dollars should be given by the successful bidder.

At this point a new obstacle arose to embarrass the Commission. The consolidation of New York, Brooklyn and other municipalities took effect on the 1st of January, 1898, and resulted in the new City being saddled with a load of debt, the amount of which was difficult to ascertain, but which was believed to be in excess of the constitutional limitation. The administration which had come into power upon consolidation was hostile to the plans of the Commission, the first public utterance of the new Mayor having been to favor extensions of elevated railroads as the only prompt and effectual means of meeting the pressing difficulties of the hour. Accordingly, the form of contract for construction of the railroad which was sent, in compliance with the statute, to the Corporation Counsel for his approval as to form, early in the year 1898, remained unacted upon for nearly eighteen months. Communications to the Board of Estimate and Apportionment and other officials of the City also remained unanswered. But at last the City administration completely reversed its policy. On September 20, 1899, the Corporation Counsel announced that he was willing to approve the form of the proposed contract, subject to certain trifling changes of detail, and the Board of Estimate and Apportionment announced its readiness to issue bonds for the construction of the road. The contract was at once put in satisfactory shape, the Appellate Division consented to reduce the amount of the bond to $5,000,000, and bids were advertised for and opened in the month of January, 1900.

Up to the hour of opening bids the Commission were uncertain whether any person could be found to undertake the work of building the railroad even upon the most favorable terms which the Act permitted. Every transportation interest in New York City had been approached by the Commission and urged to bid; but without exception every one connected with the business of civic passenger transportation declined to consider the contract, and expressed their entire disbelief in the success of such an enterprise. The only two bids which were submitted came not from railroad men, but from practical contractors, who evidently expected to be able to dispose of their contracts to those who might be more interested in the operation of the road than in its construction. The successful bidder, Mr. John B. McDonald, was able to realize these expectations, and, through the co-operation of Mr. August Belmont, the present Interborough Rapid Transit Company was formed, and the plans of the Commission were thus carried forward to completion.

As soon as the contract had been made for the Manhattan-Bronx Railway, the Board took up the question of a railway to Brooklyn, which would serve to extend the Manhattan-Bronx subway from the Brooklyn Bridge to the Battery, and thence under the East River to the junction of Flatbush and Atlantic Avenues in Brooklyn. The bids for this contract also were two in number, but this time they came from transportation interests. One was from the Brooklyn Rapid Transit Company, who offered to build for Seven million dollars and give a continuous trip for a single fare not exceeding five cents, without change of cars, over a large part of the Borough of Brooklyn. The Interborough interests offered to build the railroad for Two million dollars, and to carry the passengers over the Manhattan-Bronx Subway, at least as far as 59th Street, for a single fare of five cents. As this latter bid was about one-fifth of the estimated cost of construction, it was accepted by the Rapid Transit Board, and the Board of Estimate and Apportionment authorized the issue of bonds for its construction. That railway is now in successful operation from the Brooklyn Bridge to the Battery in Manhattan; but certain changes of plan to afford greater facilities in Brooklyn and the unforeseen difficulties in construction under the East River,—

difficulties of a kind in which the Pennsylvania Railroad Company has fully shared,—have delayed the completion of the line to Brooklyn.

It was, of course, foreseen by the Board that these two railroads were a mere instalment of what the City ought to build, and the problem of laying out a comprehensive system of rapid transit for the whole City has engaged the attention of the Board ever since the Manhattan-Brooklyn contract was let. It was their own judgment and the judgment of their engineers that such a system should not be finally adopted until after a substantial part of the subway was in actual operation, so that the practical working of such a system (which, after all, was largely a matter of experiment) could be better understood. The first subway train in this City ran on October 27, 1904, and in the spring of 1905, the Board adopted and submitted to the City authorities its comprehensive plans, embracing nineteen different routes, and reaching every Borough of the City except Richmond. This scheme in its more important parts has finally, and after a delay of nearly two years, received the necessary constitutional consents.

Limitations upon the rapidity with which construction can henceforward be carried on will probably be of a financial nature. The resources of the City of New York, magnificent as they are, are not unlimited; and it is certain that if any large measure of relief is to be obtained, these resources must be largely drawn on. The comprehensive scheme of this Board has been fitly characterized by the Court as "the most stupendous scheme of municipal improvement and expenditure ever undertaken, and without a parallel in its ultimate bearing upon the destiny of the people of what we have reason for thinking will be the greatest city in the world." (114 App. Div. 381.)

How far recent legislation and the demands of the public for better terms from contractors may lead to increased cost to the City is something which the future must disclose. The Board, however, believes that it may now justly congratulate the City upon the prospect of being in a position where, if the money can be found, the people may soon secure a complete, thorough and permanent solution of the more pressing problems of passenger transportation,—problems which are made urgent by the size and difficult by the amazing rapidity of growth of the metropolis.

LEGISLATION.

Very radical changes were made in the Rapid Transit Law during the year by the passage of what came to be known as the Elsberg Bill, which, while it embodied various modifications which seemed desirable to the Board, also introduced features which the Board felt it could not approve.

A serious effort was made early in the year to come to an agreement with those who were advocating changes in the law so that the features which the Commission believed to be harmful might be eliminated from the bill, and conferences between representatives of this Board and representatives of various civic organizations seemed to indicate that a compromise measure might be agreed upon. These efforts, however, did not succeed, and the bill ultimately passed both houses of the Legislature in a form which was so unsatisfactory to this Board that they felt it their duty to oppose its approval by the Mayor, and to file with him a statement of reasons for so doing. The following extracts from the memorandum will show what changes were made in the existing law and what features were particularly objected to by this Board:

The Board of Rapid Transit Railroad Commissioners respectfully represent that, in their judgment, Senate Bill No. 915, commonly known as the Elsberg Rapid Transit Bill, should not be accepted by the City.

In support of this conclusion they submit the following considerations:

WHAT THE BILL IS.

The bill now under consideration radically changes the existing rapid transit law. The changes thus effected were not asked for by the City administration or by the Rapid Transit Board. They were urged by private citizens and organizations, many of whom were avowedly in favor of municipal operation of street railways. That fact is not a controlling argument against the bill, but it certainly is a circumstance which should be remembered in dealing with the subject.

The following are the amendments which are proposed to the existing law:

1. The first section of the Rapid Transit Act is amended by adding a provision to the effect that vacancies which may hereafter occur in the Board are to be filled by the Mayor.

2. Section 6 of the Act is amended so as to permit pipe galleries to be constructed, not only when they are necessary for the proper construction of a railroad, but also "for any other purpose in furtherance of the public interest or convenience."

3. Section 32 of the Act is radically changed.

As the law now stands the Rapid Transit Board has the power to grant franchises for the extension of existing railroads in the City, and for the construction of such tunnel railroads as may be built for the purpose of connecting points within the City with railroads outside the City upon such "terms, conditions and requirements as to the said Board may appear just and proper." There are two, and only two, limitations upon the powers of the Board in this regard, viz.: *First,* that any company to whom a franchise is granted must pay an annual rental, which must be readjusted at intervals of not more than twenty-five years, and *second,* that the approval of the Board of Estimate and Apportionment and a majority of the abutting property owners must be obtained. If a majority of the abutting property owners do not consent, the approval of the Supreme Court may be obtained instead.

Under these provisions of the law the Pennsylvania Railroad tunnels were authorized, as were the other tunnels now building to Jersey City from Cortlandt and Christopher Streets.

The Elsberg bill proposes to restrict the general powers of the Board to the case of a tunnel railroad intended to connect with some "trunk line steam railroad" whose terminus is in another

State, or to the case of a railroad engaged in interstate commerce whose terminus is in the City and which desires to extend its line under or over the East, Hudson or Harlem Rivers.

The Elsberg bill next provides by a new section, numbered 32-a, that the Rapid Transit Commission may grant franchises for extensions of or additions to any existing railroads in the city; but it limits all such franchises to a period of twenty-five years, with renewals not exceeding twenty years more, and it requires all the property of the grantee constructed under the franchise, "except rolling stock and other movable equipment," to become the absolute property of the City at the termination of the franchise period, without further or other compensation to the grantee.

It is expressly declared that "the provisions of this section shall apply to any railroad or railroads constructed, constructing or contracted for under the provisions of Section 34 of this Act, and to any person, firm or corporation constructing or operating such railroad or railroads."

In other words, the Interborough Company may be given a franchise to build extensions under Section 32-a.

4. Section 34, the most important in the Act, is also entirely remodelled. Under the familiar provisions of this section, the Rapid Transit Board is empowered to contract (subject, of course, to the approval of the Board of Estimate and Apportionment) for the construction, equipment and operation of any railway duly authorized. Within very broad limits, the Rapid Transit Board may frame such a contract as it deems best. There are, however, some few definite requirements. The contractor who builds the road must agree, as part of the bargain, to equip it at his own expense, and to operate it for a period of not more than fifty years. He must pay rent during the period of operation—such rent to be not less than the interest on the City's bonds issued for construction *plus* one per cent. The contractor must deposit a large sum of money in cash, and give a "continuing bond" as security. The equipment furnished by the contractor, including power houses, is to be subject to a first lien in favor of the City.

There is no question but that this law has worked well; and in such a case it is the part of wisdom to look with the greatest care at any proposals for a change.

The Elsberg bill substitutes for the present Section 34, six sections numbered 34, 34-a, 34-b, 34-c, 34-d and 34-e.

The new Section 34 provides in general terms for the making of a contract or contracts for the construction of a railroad, after the necessary consents have been obtained. The Rapid Transit Board is also authorized to provide for the equipment of the railroad at the public expense; and this they may either include as a part of the contract for construction or provide for by separate contracts.

By Section 34-a, the Rapid Transit Board is authorized, subject to the approval of the Board of Estimate and Apportionment, to enter into a contract for the equipment and operation of a road constructed by the City. The period for operation is not to exceed *twenty* years; the rent is to be not less than interest on the City's bonds issued for construction *plus* one per cent; there may be a renewal or renewals for not more than twenty years; and the City is to have a lien on equipment.

By Section 34-b it is provided that if the Board of Estimate and Apportionment thinks that a contract for equipment and operation is "inexpedient, impracticable, or prejudicial to the public interest," the Rapid Transit Board must equip the road at the public expense and lease it for a term of not more than *ten* years. The rent is to be based on the total amount of bonds issued both for construction and operation; and renewals are not to exceed ten years in the aggregate.

Section 34-c contains general provisions affecting all the various kinds of contracts authorized by the previous sections. These provisions are not new, but are transferred here from the present Section 34.

Section 34-d provides that if the Board of Estimate and Apportionment is of opinion, in any case, that a lease would be "inexpedient, impracticable or prejudicial to the public interest," the Rapid Transit Board is to maintain and operate the road for and on behalf of the City. The rates of fare are to be so adjusted as to provide for operating expenses, interest on cost, a sinking fund, &c. When practicable, fares are to be reduced for school children and during "rush hours." No part of any road constructed under this Act is to be used for advertising purposes, or for carrying on any but railroad business,—except the sale of newspapers or periodicals.

The next section reads as follows:

> SECT. 34-e. Nothing contained in this act shall be deemed, or be construed as intending, to limit, or as limiting, in any manner, the discretion of the Board of Rapid Transit Railroad Commissioners, provided in the opinion of the Board of Estimate and Apportionment, or other analogous local authority of such city, it is expedient, practicable and in the public interest to do so, to enter into contracts for construction, equipment, maintenance and operation with the same person, firm or corporation, or for any one or more of said purposes with the same person, firm or corporation, or with different persons, firms or corporations, either in one contract or in separate contracts, and at any time or times.

5. Sections 35, 36, 38, 39, and 64 are amended in immaterial respects so as to conform to the changes made in Section 34, and also so as to permit the sale of four per cent. bonds.

Section 65, which prohibits the construction of Street Surface Railroads under the Act, is repealed.

PRACTICAL EFFECT OF THE ELSBERG BILL.

The Rapid Transit Board in May and June, 1905, adopted nineteen new routes for rapid transit railways in various parts of the City. These were all approved by the Board of Estimate and Apportionment and the Mayor in July, 1905. Since then, the Board and its counsel have been diligently engaged in getting the consents of property owners and the Appellate Divisions of the Supreme Court.

If the Elsberg bill becomes a law there will be four courses open to the City in the case of each of these railroads, viz.:

1. To *construct* the road under one or more contracts, and then to make a separate contract for *equipment and operation.*

2. *To construct and equip* it under one or more contracts, and then to make a separate contract for *operation.*

3. To *construct and equip* it under one or more contracts, and then to resort to *municipal operation.*

4. To make one contract for *construction, equipment and operation.*

The Rapid Transit Board will have nothing to say as to the course to be pursued. That responsibility, under the Act, is placed solely upon the Board of Estimate and Apportionment; and it will be for the latter body to decide in respect to each one of these nineteen roads what proposals are to be invited.

The Rapid Transit Board will be required to settle the details of contracts, to advertise for bids, to make awards (subject to the approval of the Board of Estimate and Apportionment), to supervise the execution of the contracts and, perhaps, to operate the road.

If either one of the first three alternatives is selected—that is to say, if the person who *constructs* the road has not also agreed to *operate* it—the City will inevitably have to pay the full cost of building the road, including contractor's profit. If the last alternative is selected, and the person constructing the road is given the privilege also of operating it for a term of years, then (if the operating contract is sufficiently attractive) the City may be able to induce the contractor to build for less than cost.

The best contract for the City is one by which the contractor will agree to construct a road with his own money; where the term of the operating contract or lease is as short as may be necessary to attract bidders; and where the City retains the greatest practicable power of control. If the terms are made too onerous there will be no bids, or only bids from those who have exceptional advantages for operating. In other words, very stringent terms necessarily discourage competition.

As the law now stands, the Rapid Transit Board, subject to the approval of the Board of Estimate and Apportionment, has very wide authority. *The test as to whether the present law is good or bad is the enquiry whether the power of the local authorities is enlarged or restricted.*

This view was suggested and is admirably expressed in the Mayor's letter to Senator White, dated February 26, 1906, the keynote of which is in the following passage:

> "I am in favor of all legislation which increases the powers of the local authorities—which, in other words, extends the principle of home rule. *I am opposed to all legislation which either directly or indirectly seeks to limit the powers of the local authorities.* I am in favor of legislation which permits the City to resort to municipal operation of rapid transit lines in case of need. I am opposed to legislation intended to compel the City to embark upon municipal operation.
>
> As I have stated publicly on more than one occasion, I do not favor extending the field of municipal operation of public utilities in New York City, except in cases where private capital will not meet the reasonable needs of the people of the City upon fair terms. I accordingly regard as objectionable legislation which either compels the City to engage in the municipal operation of rapid transit lines or which so hampers the public authorities in securing the investment of private capital in rapid tranist lines that municipal operation will become the only practical means of meeting the City's needs for additional rapid transit facilities."

The questions to be considered are, therefore, these: Does the bill increase the powers of the local authorities? Or does it limit such powers? Does it enable the local authorities to secure the investment of private capital in our future railroads on fair terms? Or does it tend to make municipal operation a practical necessity?

MERITS OF THE BILL.

To a certain extent, the bill does enlarge the powers of the local authorities, and to that extent it is meritorious.

A. At the present time, the only form of contract that can be offered for public bidding is one which unites the construction, the equipment and the operation of the road. If genuine competition could be expected in every case, no other kind of contract would (in our judgment) be desirable, and we would advocate leaving the law unchanged. But at the present time, competition—in respect to several of the projected lines, especially in Manhattan and The Bronx—may not develop. In order to meet this condition of things, it is well that the local authorities should have the power to fall back upon alternative methods of dealing with the situation in case "private capital will not meet the reasonable needs of the people of the City upon fair terms."

These alternative methods the bill does, in a clumsy way, undertake to provide. It authorizes (as we have pointed out above) four different methods by which provision can be made for the construction, equipment and operation of rapid transit railroads. These features of the bill, so far as they afford greater freedom of action to the City authorities, are approved by the Rapid Transit Board.

B. The amendment which provides for filling vacancies in the Board by appointment by the Mayor, is also commendable.

C. The provisions in respect to pipe galleries are permissive and enlarge the powers of the local authorities, and are approved.

D. The change which allows rapid transit bonds to bear four per cent. interest was suggested by the Rapid Transit Board and the Comptroller, and is obviously desirable.

DEFECTS OF THE BILL.

A. We have already referred to the clumsy phraseology of certain parts of this bill. The Rapid Transit Act as it now stands was in large part the work of that accomplished lawyer and judge, the late Henry R. Beekman, and, while it is voluminous, it is everywhere technically exact. Considering the magnitude and variety of the interests involved among contractors, abutting property owners, &c., there has been a surprising absence of litigation requiring judicial interpretation of the statute.

The amendments introduced by the present bill consist either in transposing sentences from the present law so as to bring them into quite different relations; or in adding new provisions, which are generally expressed in artificial and obscure language. The bill in its present form has been repeatedly changed from the original draft by inserting phrases and even whole sections drawn by different hands, and is, indeed, mere patchwork. The general result is a piece of legislation that is full of obscurities, and illogical and confusing in arrangement.

These defects of form would alone justify a refusal by the City to accept the bill.

B. The amendments to Section 32 of the bill are strikingly bad in form. We think they are also bad in substance, in that they limit the discretionary powers of the local authorities to deal with the general subject which the section was intended to cover. Under the section as it now stands, the local authorities have almost unlimited power. Under the section as it is amended, that power is restricted by narrow and complicated provisions.

Apart from this general objection to the amendments, there are special objections.

Section 32, as amended, allows tunnels under the North River to connect with some "trunk line steam railroad" in New Jersey. Under this provision no new tunnel railroad could be authorized to connect with an *electric* railroad in New Jersey. If the bill should become a law, it would give the so-called McAdoo companies a monopoly of that business.

Again, under Section 32-a, a franchise may be granted to the Interborough Company to extend the present rapid transit railroad; but this is restricted to a period of twenty-five years, with one renewal of twenty years, or forty-five in all. If such a franchise were asked for and granted now, it could not be made to expire at the same time as the lease of the existing railway—to the manifest injury of the City.

C. The new sections 34-b and 34-d begin by providing that if *in the opinion of the Board of Estimate and Apportionment* certain forms of contract are "inexpedient, impracticable or prejudicial to the public interest," then the Rapid Transit Board is to do certain things.

These provisions are contrary to the whole tenor of the Rapid Transit Act, and of the charter. The Board of Estimate, generally speaking, does not act of its own motion, but only on proposals prepared for it and submitted to it by the Borough Presidents and the heads of Departments.

If the Rapid Transit Board is to continue to exist at all, its work can only be wisely performed by allowing it the initiative in planning both the scope of its undertakings and the manner in which they are to be carried through. The proper function of the Board of Estimate is to examine and criticise these plans when presented —just as it examines and criticises the plans of a Borough President for a section of the city map or his projects for a drainage area.

The Board of Estimate and Apportionment has no special acquaintance with the facts which may make one form of contract more or less expedient in a particular case. That special knowledge the Rapid Transit Board possesses, and in every other part of the Rapid Transit Act it is the Rapid Transit Board which is to plan and suggest, and the Board of Estimate and Apportionment which is to approve and authorize. The two sections just referred to are therefore anomalous, and may lead to serious confusion and delay.

D. But the most serious defect in the bill is the provision of Section 34-a, which limits the possible length of a lease to *twenty* years, with "a renewal or renewals not to exceed twenty years in the aggregate." The public is confidently expecting that the Rapid Transit Board in the near future will let contracts for new subways. This expectation the Board feels cannot be realized if the Elsberg bill becomes a law, because practically the City has not the money necessary to build an adequate system of subways; and we believe that no private capital can be induced to construct such lines as the Lexington Avenue, the Third Avenue, the Seventh and Eighth Avenues or the Brooklyn Loop subways, upon a lease limited to twenty years with a renewal of twenty years on new terms.

The law now provides that the lease shall be for not more than *fifty* years, and that the contract may provide for "a renewal or renewals of the lease of said road"—without limit. The Elsberg bill, in shortening the maximum length of the original lease and putting a limit on the length of renewals, directly limits the powers of the local authorities in dealing with this most important feature of a rapid transit contract. It does more. In all probability it will be found that it "so hampers the public authorities in securing the investment on private capital in rapid transit lines, that municipal operation will become the only practical means of meeting the City's needs for additional rapid transit facilities."

It has been suggested by the supporters of the Elsberg bill that under the language used, the terms of renewal might be all agreed on in the original contract so as to make, in effect, a forty years' lease. The contrary opinion was expressed by the Court of Appeals in the case of the Sun Printing and Publishing Company *vs.* The Mayor, 152 N. Y., 257, 271. The Court there said:

> "The evident intention was that *at the expiration of each term* for which the road had been leased, a new contract should be made for the re-leasing of the road upon such terms and conditions as to the board should *then* seem just, not upon such terms and conditions as shall be fixed at the time of entering into the original lease."

It thus appears that if the bill becomes a law in its present form all that can be offered to bidders will be a lease for twenty years, and that they will have to take their chances as to the terms of the renewal at the period of expiration of the original lease.

There seems to be, as we have said above, no inducement to any independent bidder to offer to construct any one of the projected subways upon the basis of a twenty years' lease. If, however, the City would pay the entire cost of construction, the Interborough-Metropolitan Company, with their four great power houses already furnishing a vast amount of power, and readily capable of expansion, would be in a totally different position. In that case they could equip any one of the subways at a relatively insignificant cost; but even the Interborough-Metropolitan Company cannot be expected to invest any private capital in building a road under Section 34, with only the assurance of a twenty years' lease. They might, perhaps, find it worth while to build extensions under Section 32, but no independent road could be built under that section. For any independent road, we feel confident that the City would have to find every dollar needed for construction.

In short, it may be truthfully said that if the City is to get favorable terms for building new railroads, or is ever to get competition with the Interborough-Metropolitan Company, it must be in a position to offer to other bidders terms which are comparable with those heretofore offered. To deny the City the right to offer a reasonably attractive lease is simply to intrench the present monopoly.

It is not suggested that the Legislature consciously intended to favor the Interborough-Metropolitan Company; but, in our opinion, the passage of the Elsberg bill under the present financial conditions of the City must, in effect, operate to prevent the construction of any rapid transit roads, except possible extensions of the present Interborough System—thus leaving the field to that Company without competition.

The reasons which actuated those who insisted upon shortening the permissible term of a contract from fifty to twenty years must have been either a desire to force the City to resort to municipal operation, or else a conviction that the local authorities (*i. e.*, The Rapid Transit Board and the Board of Estimate and Apportionment) are not to be trusted. Any bill which appears on its face to be either intended to check the local authorities, or to compel municipal operation of street railroads, is essentially vicious.

CONCLUSIONS.

To summarize the foregoing, we submit that this bill, while containing some desirable features, has fatal defects.

Its merits are:

That it allows the City to construct, and even to operate, rapid transit railroads, "in cases where private capital will not meet the reasonable needs of the people of the City upon fair terms."

That it provides for filling vacancies in the Rapid Transit Board by the Mayor's appointees.

That it allows the City to build pipe galleries.

That it allows the City to sell Rapid Transit bonds bearing four per cent interest.

Its defects are:

That it is so badly worded as to raise serious legal doubts as to its meaning.

That Section 32 has been so amended as to limit unduly the powers of the local authorities and to give a monopoly of the electric railroad business between New York and New Jersey to the two existing companies.

That it deprives the Rapid Transit Board of its initiative in respect to the form of contracts, thus imposing undue burdens on the Board of Estimate and Apportionment.

Above all, that it limits the length of a lease to twenty years, which, for practical purposes, might as well be one year. A limitation to twenty years will probably make it impossible to find any bidder willing to equip and operate an independent road. In the present financial condition of the City, the only reasonable hope of early rapid transit construction of independent lines lies in offering a lease sufficiently attractive to induce the investment of private capital in the construction of the roads, and we fail to see how, under the Elsberg bill, any such inducement can be offered.

These defects, in the judgment of the Rapid Transit Board, are so serious that the bill in its present shape ought not to be accepted by the City.

Dated New York, April 20th, 1906.

The Board of Rapid Transit Railroad Commissioners for the City of New York,

A. E. ORR, President.
BION L. BURROWS, Secretary,

Notwithstanding the views thus expressed by the Board, the Mayor concluded to approve the bill, and the Board considered that they were not called upon to persist in opposing a measure which had received the approval of both houses of the Legislature and of the Mayor of the City of New York. They therefore refrained from opposing it before the Governor, and the bill was signed and became a law on May 16, 1906.

After the passage of the Elsberg bill by the Legislature, another Act was passed to remedy some of the minor defects in the measure which the Board had pointed out in Section 32, relating to the construction of extensions by existing railroads. And by a separate measure the Rapid Transit Act was further amended by the insertion of a provision that before any contract was finally adopted by the Rapid Transit Board, public hearing should be had upon a published notice of at least two weeks.

PROCEEDINGS TO OBTAIN CONSENTS TO NEW CONSTRUCTION.

As stated in the report of the Board for the year 1905, the applications made to the Appellate Division in the First Department to appoint Commissioners to pass upon several of the routes laid out by this Board were not granted during that year. This was owing to the pendency of the case of *Wilcox vs. McClellan,* which involved the constitutionality of the act which took from the Board of Aldermen the power to control the use of the streets and transferred it to the Board of Estimate and Apportionment. The case having been disposed of by the Appellate Division on December 29, 1905, that Court fixed January 26, 1906, as the day on which they would hear the applications for appointment of Commissioners, and shortly afterwards Commissioners were appointed in ten cases in the First Department in which consents had not been obtained.

In nine of the cases above mentioned the reports of the Commissioners were made and filed with the Appellate Division before the close of the month of May, 1906, and were presented to the court for confirmation early in the month of June. Some minor objections were made to the confirmation of those reports, and one important question was raised involving the consideration of the debt incurring capacity of the City.

When the Appellate Division of the Supreme Court, in 1896, passed adversely upon the plans of the Commission at that time for a Broadway route, the court had gone deeply into the question of the City's financial ability to undertake the work then proposed. They had expressed the opinion that it was doubtful whether any large part of the railroad could be built with the money then at the disposal of the City, and they believed it to be certain that the expenditure of so vast a sum as was contemplated would take away the City's power to engage in any other public work, and might possibly so impair its credit that it could not recover in the course of many years. These arguments were in effect repeated on the hearing before the Appellate Division in June, 1906, and counsel for certain objecting taxpayers earnestly contended that the Court should withhold its approval of all the routes then before it for consideration.

On July 12, 1906, the Court announced its decision to confirm all the routes then before it, subject to one important restriction. After discussing the arguments of counsel and pointing out that the City's limit of debt incurring capacity was not a fixed or constant quantity, the Court said:

> "Much difference of opinion exists about the effect of the recent amendment to the Rapid Transit Act upon the probability of enlisting private capital in new rapid transit construction, but it is plain that the Rapid Transit Commission cannot offer as attractive terms to bidders under the new law as it was able to offer under the old law. A lease for twenty years, with a possible renewal for twenty more upon terms to be fixed at the expiration of the first period, must be far less attractive to bidders."

The interests of abutting property owners, it was pointed out, was also a matter for serious consideration, especially in view of the fact that the value of vaults and other sub-surface structures appurtenant to abutting property had greatly increased in recent years, and that although such owners must be content to vacate whenever the City needed the space occupied, it was one thing to ask them to vacate to make way for a road which was building, and another thing to permit an important street to be pre-empted for a road which might not be built for many years to come. The opinion continued:

> "Regard being had, therefore, to these different and conflicting interests, we think the right solution, so far as it rests with this Court, will be to approve all of the routes conditionally upon the Rapid Transit Commissioners deciding within two years which of them they have finally concluded to construct. This will enable them within the period named, in view of the then existing condition of the City's finances, to determine just what routes should be built; and after that time they should be required, if able to construct other routes,

> to renew their application to this Court. This will render null and void our approval of all routes not selected and contracted for within two years."

As the Court adjourned for the summer immediately after this decision had been announced, it was impossible to enter the formal orders of the Court until the month of October; but the orders in the nine cases included in the foregoing decision were all entered at the following dates.

Van Cortlandt Park Extension	October 18, 1906
Fourteenth Street, University Place, Greenwich Street and Liberty Street Route	October 19, 1906
Thirty-fourth Street Crosstown Line	October 19, 1906
Third Avenue Route	October 19, 1906
Lexington Avenue Route	October 19, 1906
Seventh and Eighth Avenue Route	October 19, 1906
Gerard Avenue Route	October 19, 1906
White Plains Route	October 19, 1906
Jerome Avenue Subway Route	October 23, 1906

Each of the said orders contains the following provision:

> "It is, on motion of George L. Rives and Boardman, Platt & Soley, attorneys for the Board of Rapid Transit Railroad Commissioners for The City of New York,
>
> "Ordered, That said motion be and the same hereby is granted; that the report of said Commissioners be and the same hereby is approved and confirmed, and that the authorization and consent of this Court be and the same hereby are given to the construction and operation of the railroad or railroads mentioned in said petition and described therein as (name of route), subject, however, to the following condition, namely, the approval and confirmation by this Court of the report of said Commissioners and of the said route and general plan of construction, shall be void and of no effect unless within two years from the 15th day of October, 1906, The City of New York, acting by the said Board of Rapid Transit Railroad Commissioners, shall have entered into one or more contracts for the construction of a substantial portion of the said railroad or railroads."

The entry of these orders completed the proceedings in respect to the nine routes above referred to. There still remained the case of the Manhattan and Brooklyn loop line in Manhattan, which could not be disposed of because of the opposition of property owners to certain features of the proposed route. This line, which was designed to run from the Williamsburgh Bridge, connecting with the Manhattan and Brooklyn Bridges, and with tunnels crossing to Brooklyn, forms an essential part of the scheme of the Commission for rapid transit communication between Brooklyn and Manhattan; but as it necessarily runs through narrow and congested streets in the southern part of Manhattan, and as the soil for a large part of the route consists of dangerous quicksands, it was natural that the owners of abutting property should be considerably alarmed at the prospect of possible injuries to their buildings. A very large mass of testimony was taken by the Commission during the year; but all the testimony was in and the case summed up before the close of 1906. Shortly after the close of the year, the Commissioners reported in favor of the route, except in William Street south of Beekman.

In the Second Judicial Department less opposition was encountered from property owners, and where the consents of the owners of a majority in value of the abutting property were not obtained, the proceedings in court progressed rapidly. Unfortunately, the consents thus obtained related to routes which could hardly be constructed as separate systems. A road beginning and ending within the Borough of Brooklyn would be of little value; and until the legal complications were overcome in Manhattan, it was impossible for the Board to do anything in the way of constructing Brooklyn railroads. Moreover, the work of construction in Brooklyn, owing to the character of the soil, is relatively cheap and easy, so that no time would practically be gained by beginning construction in Brooklyn before construction in Manhattan was possible.

The following franchises have been perfected during the past year:

IN THE BOROUGHS OF MANHATTAN AND THE BRONX.

THIRD AVENUE ROUTE,
LEXINGTON AVENUE ROUTE.
SEVENTH AND EIGHTH AVENUE ROUTE.
FOURTEENTH STREET ROUTE.
GERARD AVENUE ROUTE.
VAN CORTLANDT PARK EXTENSION.
WHITE PLAINS ROAD ROUTE.
JEROME AVENUE SUBWAY ROUTE.
JEROME AVENUE ELEVATED ROUTE.
THIRTY-FOURTH STREET ROUTE.

IN THE BOROUGH OF BROOKLYN.

FOURTH AVENUE ROUTE.
EASTERN PARKWAY ROUTE.
BROOKLYN AND MANHATTAN LOOP LINES (EXCEPT MONTAGUE STREET).

IN THE BOROUGH OF QUEENS.

EXTENSION OF THIRTY-FOURTH STREET ROUTE.

The work of perfecting the franchises upon other routes is in progress as follows:

BROOKLYN, MANHATTAN AND LONG ISLAND CITY ROUTE.

Commissioners have been appointed, and their first meeting has been fixed for February 1, 1907.

WASHINGTON STREET ROUTE, BOROUGH OF BROOKLYN.

It has been found impossible to obtain consents of property owners, and application for the appointment of commissioners will be made when directed by the Board.

WESTCHESTER AVENUE AND SOUTHERN BOULEVARD, BOROUGH OF BRONX.

The necessary consents have been obtained on 138th Street and Southern Boulevard, but we lack consents of abutting property owners on Westchester Avenue by about $25,000. It is expected that these consents will be obtained in a few days.

BROOKLYN AND MANHATTAN LOOP LINES—MANHATTAN SECTIONS.

Commissioners appointed on these routes report in favor of all of them except the William Street Route south of Beekman street. It is expected that their report will be confirmed by the Appellate Division of the First Department on February 8, 1907.

MANHATTAN BRIDGE ROUTE.

The obtaining of consents has had to await the opening of the Flatbush avenue extension in Brooklyn. Title to this street will vest in the City on March 1, 1907, and arrangements will be made to secure the necessary consents immediately after that date.

BENSONHURST, BATH BEACH AND CONEY ISLAND ROUTE.

The consents of an apparent majority of the property have been obtained, but the titles at the close of the year had not been fully verified.

Consents are still to be obtained in the cases of the following routes, viz.:

FIRST AVENUE ROUTE (MANHATTAN).
WEST STREET AND NINTH AVENUE ROUTE (MANHATTAN).
BROOKLYN AND JAMAICA ROUTE.

When these have been obtained, the authority to construct all the lines laid out by the Commission in 1905 and 1906 will be complete.

CONTRACTS FOR CONSTRUCTION.

The Rapid Transit Act as it now exists since the passage of the Elsberg Bill contemplates, as we have seen, that contracts for construction should be entirely independent of contracts for equipment or for maintenance and operation. But a new section (34-e) provides that such contracts may be united in one in case the Board of Estimate and Apportionment should think it "expedient, practicable and in the public interest to do so." The Rapid Transit Board was of the opinion that with respect to certain of the routes laid out by it, the old form of contract in which the same contractor should undertake both to construct and also to equip and operate the road, might be expedient. But before beginning the preparation of a contract which should involve more than mere construction, it was necessary (under the provisions of the law above referred to) to obtain the sanction of the Board of Estimate and Apportionment. Accordingly, on October 11th, a communication was addressed to the Board of Estimate and Apportionment, suggesting the propriety of calling for bids in the alternative; first, for construction alone, and second, for construction, equipment, maintenance and operation of certain routes which were specified.

The following are extracts from the communication referred to:

To the Board of Estimate and Apportionment of The City of New York:

GENTLEMEN—The Rapid Transit Act, as amended by chapter 472 of the Laws of 1906, provides that as soon as the necessary consents have been obtained for any rapid transit railroad, or railroads, and the detailed plans and specifications have been prepared, this Board for and in behalf of the City shall enter into a contract for the construction of such road, or roads. The Board may in any case contract for the construction of the whole road, or all the roads provided for by the aforesaid plans in a single contract, or by separate contracts executed from time to time, or at the same time (section 34, Rapid Transit Act).

By section 34-a of the act, the Board, subject to the approval of your Board, is given full power and authority to provide for the maintenance, supervision, care and operation of the railroad, or railroads, so constructed, and may enter into a contract for the maintenance and operation of such road, or roads, for a term of years not to exceed twenty years. Such contract for maintenance and operation must provide for payment of rental, and it may provide for a renewal, or renewals, not to exceed twenty years in the aggregate (section 34-a).

By the next section it is provided that if in the opinion of your Board a contract for equipment, maintenance and operation is inexpedient, impracticable or prejudicial to the public interest, the Rapid Transit Board may equip the said road, or roads, in whole or in part, at the public expense, and enter into a contract for the maintenance and operation of such road or roads so equipped for a term of years, not to exceed ten years (section 34-b).

By section 34-d it is provided that if in the opinion of your Board either a contract for equipment, maintenance and operation, or a contract for maintenance and operation as provided in the preceding sections, would be inexpedient, impracticable or prejudicial to the public interest, the Rapid Transit Board is to devise and prepare a plan for the maintenance and operation of such road or roads by the City itself (section 34-d).

The next section of the act (section 34-e) reads as follows:

"Nothing contained in this act shall be deemed, or be construed as intending, to limit, or as limiting, in any manner, the discretion of the Board of Rapid Transit Railroad Commissioners, provided in the opinion of the Board of Estimate and Apportionment, or other analogous local authority of such city, it is expedient, practicable and in the public interest to do so, to enter into contracts for construction, equipment, maintenance and operation with the same person, firm or corporation, or for any one or more of said purposes with the same person, firm or corporation, or with different persons, firms or corporations, either in one contract or in separate contracts, and at any time or times."

The foregoing review of the provisions of the Rapid Transit Act, as now in force, will show that contracts in several forms may lawfully be entered into; the choice between the various forms being left by the act to the judgment of your Board.

On the 12th day of May, 1905, this Board determined and established the routes of two railroads in The City of New York, which are called, respectively, for brevity, the Lexington Avenue Route and the Seventh and Eighth Avenue Route, and these were thereafter transmitted to your Board and approved by it on July 14, 1905, and by the Mayor on July 28, 1905. This Board immediately thereafter took the necessary steps to ascertain the names of the owners of property along these two routes, and endeavored to obtain their consents; but having failed to obtain the consent of the majority of such owners, application was made, pursuant to law, to the Appellate Division of the Supreme Court for the appointment of Commissioners. These Commissioners having reported in favor of the two routes above referred to, the Appellate Division in the First Judicial Department confirmed their finding that the two railroads ought to be constructed, but the formal order to that effect has not yet been entered.

On June 1, 1905, this Board determined and established the route of two other railroads in The City of New York which are called, respectively, for brevity, the Jerome Avenue Subway and the Jerome Avenue Elevated Road. These were thereafter transmitted to your Board, approved by it on July 14, 1905, and by the Mayor on July 28, 1905. This Board immediately thereafter took the necessary steps to ascertain the names of the owners of property along these two routes, and succeeded in obtaining the consents of a majority in value to the Jerome Avenue Elevated Road. It was found impossible after protracted effort to obtain the consent of a majority of the owners along the various streets constituting the route of the Jerome Avenue Subway, and an application was made pursuant to law to the Appellate Division of the Supreme Court for the appointment of commissioners. Such commissioners have been appointed and have recently reported favorably. It is expected that this report will be confirmed by the Court within a comparatively short time.

It is the opinion of this Board that the construction of the routes above referred to should be undertaken at as early a date as possible.

The several railroads thus planned will, if constructed, constitute complete systems of railroads on the east and west sides of the Borough of Manhattan, which on the one hand will serve to relieve the great demand for additional transit facilities on the east side of the City, and on the other will afford means for carrying a large number of passengers entering the City from Long Island and New Jersey at the Pennsylvania Railroad Station. If such systems shall be built, and shall be supplemented by the extensions to the north along Jerome avenue, or other extensions, in the Borough of The Bronx, which have been already planned, an addition to the transit facilities in Manhattan and The Bronx will have been effected that should go far to solving the rapid transit problem in these boroughs.

The cost of the Lexington Avenue Route, as estimated by the Chief Engineer of this Board, without including the equipment, is $30,000,000; and the cost of constructing the Seventh and Eighth Avenue Route, if the whole of it shall be built, is estimated by the Chief Engineer of this Board, without equipment, at the sum of $40,800,000. The Seventh and Eighth Avenue Route, it should be understood, involves certain alternatives, as set forth in the route itself, and as explained in the communication transmitted to your Board with the routes and general plans on June 1, 1905, and would in all probability not all be built at this time.

The cost of the Jerome Avenue Subway is estimated at $13,625,000, without equipment. If an elevated line along Jerome avenue is constructed north of Clarke place, there will be a saving in cost of $10,000,000.

It is apparent that if the City shall undertake to construct these routes and shall look forward either to making a lease when the construction is completed, or shall undertake to operate the road itself, the full cost of construction must be paid by the City, and (in the event of municipal operation or of the adoption of one form of lease) the City will in addition have to pay the full cost of equipment. If, however, a contract can be entered into with some person, firm or corporation who will undertake to construct, equip, maintain and operate the road, it may perhaps be possible to offer sufficiently favorable terms in a lease to induce a contractor to build the same for less than actual cost.

Before finally determining what policy the City ought to pursue, your Board will doubtless wish to be better informed than is possible at the present time with regard to the actual price for which responsible parties will undertake to build these roads, and also whether responsible contractors can be induced to equip, maintain and operate these roads when constructed for the comparatively short period of lease which the Rapid Transit Act now prescribes. At the hearing held by the Mayor on April 20, 1906, upon what was known as the Elsberg Bill, amending the Rapid Transit Act, this Board expressed serious doubts as to whether it would be possible to find any bidder willing to equip and operate an independent road under the limitation of a lease to twenty years. In the memorandum of the Mayor accompanying his approval of this bill, dated April 26, 1906, the Mayor said:

> "I fail to see, however, any substantial reason for believing that this limitation will have such an effect. While it is impossible for us to say what response will be made when these prospective leases are offered to the public, I think that in the light of past experience both here and abroad, we have the right to expect that private capital will be freely offered for investment in an enterprise which should prove to be profitable even under these conditions."

In order to ascertain the facts in this regard, the Rapid Transit Board would respectfully suggest to your Board the propriety of offering for competition a contract to be made with one person, firm or corporation for the construction, equipment, maintenance and operation of the lines above mentioned. In the advertisement for proposals it will be expedient to allow bidders to submit proposals for any one or more of the sections into which these several routes have been separated by this Board in the route and general plans as adopted and approved, so that the largest liberty of bidding may be afforded. It would also be expedient at the same time to call for bids from contractors for the mere construction of the several sections of these roads, leaving to a subsequent period (if such bids should be accepted) the making of contracts for the equipment, the maintenance and the operation of the railroads when constructed.

If, in the opinion of your Board, it is "expedient, practicable and in the public interest" to adopt the foregoing suggestion, this Board will cause detailed plans and specifications to be prepared, and a form of contract to be drafted. Under section 37 of the Rapid Transit Act, as amended by chapter 607 of the Laws of 1906, it will be necessary before finally fixing the terms and conditions of any contract, to advertise a public hearing with regard to it, and no contract whatever can be entered into unless and until your Board shall have consented thereto and prescribed a limit to the amount of bonds available for construction and equipment, and the purchase of the necessary lands or easements.

If, however, your Board shall be of the opinion that it is "inexpedient, impracticable or prejudicial to the public interest" to attempt to enter into a single contract for the construction of these roads, or any of them, the Rapid Transit Board, on being so advised, can, if desired, prepare plans and specifications and invite bids for the construction of so much thereof as your Board may determine is within the present financial ability of the City to undertake. Contracts for sectional construction need not, of course, all be executed at the same time. If these roads are to be built piecemeal it would be possible for the City to let contracts from time to time during the next two or three years, and in this way the immediate burden upon the debt incurring capacity of the City would be, to a certain extent, avoided.

THE BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS FOR THE CITY OF NEW YORK.

A. E. ORR,
President.

BION L. BURROWS,
Secretary.

The Board of Estimate and Apportionment held the subject under consideration for two months, and on December 7, 1906, adopted resolutions approving the suggestions of this Board in regard to the routes mentioned by it in the foregoing communication.

FORM OF CONTRACTS.

Before the Board of Estimate and Apportionment had acted upon the communication of this Board above mentioned, the engineering staff of the Board had entered upon the very laborious work of preparing detailed plans and specifications for the construction of various lines, and drafts for the proposed contracts had been the subject of much study by counsel for the Board; but the details were not ready for final action by the Board until after the close of 1906. Some matters were, however, considered and disposed of during the year.

In respect to future subway entrances, the Board declared its policy in 1905 when it adopted the various routes, that such entrances should in general be constructed through private property to be acquired for the purpose. It was also understood that the cost of all private property that might be taken for stations or otherwise for right of way, should be added to the cost of construction as a basis for determining the rent of the road. This is a feature of the Brooklyn-Manhattan contract made in 1902, but is not carried to the full extent.

The Board also took into consideration the question whether pipe galleries should in general be constructed at the same time as the future railroads. The matter was formally brought to the attention of the Board by the Chief Engineer, who asked for instructions in making up the final drawings. The Board thereupon adopted the following resolution:

> "*Resolved,* That this Board hereby directs its Chief Engineer to prepare plans and specifications for the construction of pipe galleries in connection with all new subways, it being the purpose of the Board to have such galleries constructed wherever possible at the time of constructing future subways."

In the case of the Lexington Avenue Route, where express tracks are essential to rapid operation of trains, and where the street is comparatively narrow, it was determined by the Board to adopt plans for a "double-deck" structure, in which the local tracks should occupy the upper level and the express tracks should be upon the lower level. This will introduce a somewhat novel feature.

The Board has also given considerable attention to the question of the equipment of new rapid transit railways, particularly in respect to the rolling stock. The construction of cars has been examined with respect to the convenience of passengers, the rapidity of ingress and egress, the proper application of motive power, and the use of non-inflammable materials.

There is, however, a very great difficulty in undertaking to lay down in advance any definite, precise requirements as to those points. The whole subject of electric traction is comparatively new. The views of engineers on this subject have changed materially, and are still changing. Development and progress in this field is so rapid that it has always seemed to the Board the proper course to defer decision in respect to all details to the last moment fixed by the necessity of beginning the operation of trains by a certain time. For this reason, the Board in making the first rapid transit contract in 1900, thought it unwise to prescribe in detail the equipment to be used in the subway, and contented themselves with general provisions defining the results aimed at rather than the precise means of accomplishing such results. In that case, although the contract entered into was dated February 21, 1900, the sub-contracts for electric train equipment were not closed until the year 1903, and during those three years the development in the art of car building was so great that the equipment actually put in service was far superior to anything that could have been foreseen when the specifications were drawn by the engineers of the Commission. To a certain extent this experience is quite likely to be repeated; and it would probably be unwise to attempt, by specifying definite types, to limit a contractor, who is both to equip and operate the road, in the selection of what may appear to be the best obtainable rolling stock.

ELEVATED BRIDGE LOOP.

As stated in the report for 1905, a proposal for an elevated railway connection between the Brooklyn Bridge and the Williamsburgh Bridge, to run through Centre street and Delancey street, was laid before the Board, and was the subject of full discussion. To quote from the report for last year:

> "The Board, believing that the problems of communication between the various parts of Brooklyn could better be solved by the construction of the subway lines as proposed in the rapid transit roads described in the former portion of this report, and being satisfied that the great weight of public

> opinion in Manhattan (through which it was proposed to build those elevated structures) was firmly and irrevocably opposed to any new elevated railroads, determined to take no action upon the plans proposed."

The matter rested there until the month of July, 1906, when it was again brought to the attention of the Board by the Comptroller, who suggested that an elevated structure should be built, —not as an alternative to a subway connection, but as an addition to it. The Comptroller proposed that "as soon as the subway connection is completed and the congested points at the bridges are relieved, the elevated structure should be torn down." On July 19th the Board of Estimate and Apportionment adopted a resolution requesting this Board to consider whether it was for the interest of the public and the City that an elevated railroad should be constructed along the routes above described, "or whether the desired relief should be secured by some other plan not involving the erection of more elevated railroads in the tenement section of the lower East Side."

On September 13, 1906, the Chief Engineer of the Board presented a report suggesting that if an elevated structure was to be constructed, it would be advisable to build it along the Bowery and on Park Row over the existing Manhattan Railway tracks, which would really involve the reconstruction of the Manhattan structure. A very comprehensive subway system forming connections between the bridges and various tunnels was presented at the same time by the Chief Engineer for examination.

The subject received a great deal of consideration by the Board, but the conclusions expressed in the report of 1905 remained unreversed.

In connection with this discussion, it is of interest to note that the cars now in use in the subway could be run over the Brooklyn Bridge. The comparative weights of the trains was the subject of careful examination, and it was found that the difference in weight per linear foot between the Brooklyn Rapid Transit cars and the cars of the Manhattan-Bronx subway was only three per cent per foot.

The Chief Engineer, in his report on the connection between the bridges, pointed out that if a subway connection in Brooklyn was to be adopted which would unite the Brooklyn Bridge with the subway system in Fulton street, it would be necessary to build a short additional piece through Washington street. Accordingly, in order to make such a connection possible, the Board, after giving an opportunity for a public hearing, adopted on November 1, 1906, the general plans of such a railroad, which were duly approved by the Board of Estimate and Apportionment on November 23, and by the Mayor on November 26, 1906. The consents of a majority of the abutting property owners cannot be secured, and an application must be made to the Supreme Court for its consent.

PROPOSED RAILWAY TO CONEY ISLAND.

The Board in 1905 had adopted a route running down Fourth avenue, Brooklyn, as far as Fort Hamilton.

In January, 1906, the subject of an extension of this route was considered. It was proposed that a branch should start at about Fortieth street and Fourth avenue, and run through Borough Park and Bensonhurst to Coney Island. Accordingly the engineering staff of the Board were instructed to study the line and to prepare the necessary plans and profiles. On March 22, 1906, the proposed route was adopted, but it was disapproved by the Board of Estimate and Apportionment under date of May 25, 1906, upon the sole ground that the route should end with a terminal loop at Coney Island instead of in a stub end, as proposed. With this modification the route was readopted by the Rapid Transit Board on June 7th, approved by the Board of Estimate and Apportionment on June 8th, and by the Mayor on June 14th, 1906. The owners of a majority in value of the abutting property have consented to the construction of this route, and bids for its construction will be invited as soon as arrangements can be made for constructing the Fourth avenue line, with which this route is connected.

The following communication, sent to the Board of Estimate and Apportionment when the route was first proposed, states more in detail the line of the railway and the reasons for its adoption:

To the Board of Estimate and Apportionment of the City of New York:

The Board of Rapid Transit Railroad Commissioners for The City of New York was heretofore duly organized pursuant to Chapter 4 of the Laws of 1891, as amended, and since such organization it has conducted the inquests and investigations necessary to determine whether it is for the interest of the public and of the City that a rapid transit railway or railways for the conveyance of persons and property should be established therein; and after such inquests and investigations has duly determined, by resolutions adopted on the 22d day of March, 1906, by the concurrent vote of at least six of its members, that the rapid transit railway hereinafter described, in addition to any already existing, authorized or proposed, is necessary for the interest of the public and the City, and has duly determined and established the routes thereof and the general plans of construction; and it herewith transmits to your honorable body certified copies of the routes and general plans so determined and established.

Briefly stated, the proposed route begins at a point in Fourth avenue, in the Borough of Brooklyn, at which connections (without grade crossings) can conveniently be made with the projected subway running under Fourth avenue from Flatbush avenue to Fort Hamilton. From thence the new route runs under Fortieth street and New Utrecht avenue to Eighty-sixth street, then through Eighty-sixth to a point between Twenty-third and Twenty-fourth avenues, where it emerges from the ground and becomes an elevated railway, and continues thence over Eighty-sixth street and Stillwell avenue to Coney Island. In effect the proposed route is an extension of the Fourth avenue and Fort Hamilton subway, the plans for which were approved by your Board on July 14th, 1905, and by the Mayor on July 28th, 1905. This latter route is so planned, as the records of your Board will show, that connections can be made with the subway now constructing and with the Prospect Park extension heretofore authorized, and also with the Brooklyn and Manhattan loop lines, approved by your Board on July 14th, 1905. In this way direct communication may be established between all points along the new route herewith submitted, and the points in the Boroughs of Brooklyn, Manhattan and The Bronx, which are reached either by the present subway or by the Brooklyn and Manhattan lines above referred to.

The proposed new route traverses a part of the Eighth Ward and practically all of the Thirtieth and Thirty-first Wards in the Borough of Brooklyn. The population of this district at the present time is said to be upwards of ninety thousand, and is increasing at a very rapid rate. Borough Park, Bensonhurst, Bath Beach, Blythbourne, Martense, Lefferts Park and Homewood are the local designations of various parts of the district through which the route passes after leaving Fourth avenue and before reaching Coney Island. It is stated that during the year 1905 building improvements in the district involved an actual expenditure of six million dollars, and that the average house constructed was built at an expense of from five thousand to ten thousand dollars. It is anticipated that the year 1906 will see a like increase.

The population of the district is made up almost exclusively of persons who are engaged in business in the Borough of Manhattan, and who go to and fro between their residences and their places of business every day. The present means of communication are overcrowded, uncomfortable, inadequate and probably incapable of being materially improved.

The figures above given as to the population of the district through which the road passes do not include the population of Coney Island nor the number of transient visitors. The Commission is informed that in the year 1905 twenty-eight million persons visited Coney Island, and that ninety-four per cent. of this number came from the borough of Manhattan. It is, of course, unnecessary for the Commission to call the attention of your honorable Board to the desirability of improving by every possible means the conveniences of travel between Coney Island and the rest of the city, nor to call attention to the delay and difficulty of reaching that point at the present time. The Coney

Island traffic on the projected line of railway would, of course, be in itself a very great factor in making that a profitable line.

As above stated, the proposed new railway is to be in a subway from Fourth avenue to a point in Eighty-sixth street, between Twenty-third and Twenty-fourth avenues, where it will emerge from the ground. At certain points on this road it will necessarily be constructed at a very considerable depth below the surface, being as much as one hundred feet under Sixth avenue. This portion of the road, it is proposed, shall be of the type of subway already familiar to all the citizens of New York. Southeasterly from the point where the line emerges from the ground, near Coney Island and under the Gravesend Ship Canal. It is therefore proposed to construct an elevated railroad of a type similar to that now in operation for the rapid transit railway in Westchester avenue, Southern Boulevard and the Boston Road, it would be impossible, except at what might prove to be prohibitive expense, to construct a subway under the lowlying land in the Borough of The Bronx.

Between Twenty-third and Twenty-fourth avenues, where the railway emerges from the ground, it will be necessary to construct it partly in open cut and partly on an embankment, thus closing passage across Eighty-sixth street between the two avenues last mentioned. This mode of construction, which is similar to that on Broadway near 122d street and 135th street in Manhattan, will involve an occupation of about sixty feet in width of the entire street, leaving a very inadequate width on each side for sidewalks and roadways. It will consequently, probably, be thought expedient, if the route herewith submitted is approved, to provide for the widening of Eighty-sixth street between these two avenues. The property at that point is practically unimproved at the present time, and the necessary widening could be made without serious expense. It would doubtless be thought proper to charge the cost of such widening to the City at large, and not assess it upon the neighboring property; and it might prove possible to recover the amount from the Company operating the new railway by adding to its rental an annual sum equal to the interest on the bonds issued to pay for the street widening *plus* a suitable sinking-fund payment.

It is proper to add that a very large majority of the abutting property owners along the line have already consented to the construction and operation of the proposed railroad.

The route and general plans above set forth are submitted to your Honorable Body for its approval.

In Witness Whereof, This Board has caused its seal to be hereto affixed and these presents to be signed by its President and Secretary this 22d day of March, 1906.

[SEAL OF THE BOARD.] A. E ORR, President.

BION L. BURROWS, Secretary.

WESTCHESTER AVENUE EXTENSION.

On June 1, 1905, this Board adopted a route of a railroad beginning near Third avenue and 138th street, in The Bronx, and running thence through 138th street, the Southern Boulevard and Westchester avenue to the former village of Westchester. At that time Westchester avenue did not extend beyond Main street, in Westchester village. During the summer of 1905 plans were prepared for an avenue to connect Westchester village with Pelham Bay Park, which plans were adopted by the Borough President of The Bronx on November 15, 1905, and approved by the Board of Estimate and Apportionment on April 20, 1906.

This Board concurred with the Borough President in thinking that the proposed railroad ought not to stop at Westchester village, since a feasible line had been laid out by which Pelham Bay Park could be reached; and the Board therefore, on May 17, 1906, rescinded the former route, and proposed instead a new line following the same line from Third avenue and 138th street, but extending to Pelham Bay Park. This amended route was approved by the Board of Estimate and Apportionment on June 8th, and by the Mayor on June 14th, 1906.

Steps were at once taken to secure the consents of the abutting property owners, but, owing to the difficulty of ascertaining the names of such property owners, especially through the land covered by the new extension of Westchester avenue, the task involved serious difficulties. At the close of the year the consents of very nearly a majority of the property owners had been obtained, and it was expected that the additional consents that were needed to make up a full majority would shortly be secured.

PROPOSED TRI-BOROUGH ROUTE.

On June 22, 1906, the Board of Estimate and Apportionment adopted a resolution requesting this Board to lay out a rapid transit subway system constituting practically a single line, running from some point in the Borough of The Bronx, through Manhattan, with three terminals in Brooklyn, viz.: At Broadway and Jamaica avenue, at Fort Hamilton, and at Coney Island; and it was recommended that this entire system should be operated by one corporation.

Under date of October 11th, 1906, the Rapid Transit Board reported upon this subject to the Board of Estimate and Apportionment in the following communication:

To the Board of Estimate and Apportionment of the City of New York:

GENTLEMEN—On June 22, 1906, your Board adopted the following resolution:

"*Resolved,* That, In accordance with section 4 of the Rapid Transit Law, as amended, the Board of Estimate and Apportionment, as the local authorities of The City of New York, hereby requests the Board of Rapid Transit Commissioners of said City to proceed forthwith to the consideration of a rapid transit subway system, to serve the transportation needs of the City by a continuous system of connected routes in the boroughs of The Bronx, Manhattan, Brooklyn and Queens, with provision for a future extension under the Narrows of the transportation line into the Borough of Richmond; said rapid transit line to begin at a point in the Borough of The Bronx to be recommended by the President of said Borough, to proceed thence to the Borough of Manhattan, and along certain streets in said Borough, to be recommended by the President of said Borough, to connect with the Williamsburg Bridge, and crossing said bridge, to proceed in the Borough of Brooklyn through Broadway to Jamaica avenue, and to connect also with the Manhattan Bridge, and crossing said bridge, to proceed in the Borough of Brooklyn by way of Flatbush avenue, as extended, and Flatbush avenue and Fourth avenue to Fort Hamilton, with a spur connection at Fortieth street for extension to Coney Island; and

"*Resolved,* That the Board of Estimate and Apportionment recommends to the Rapid Transit Commission that the said rapid transit system be provided for in a contract or contracts which shall insure the operation of the entire system as recommended by one corporation, whether said corporation be a private corporation or the corporation of The City of New York."

In accordance with the terms of this resolution the Rapid Transit Board communicated with the Presidents of the Boroughs of The Bronx, Manhattan and Brooklyn. The President of the Borough of Brooklyn, under date of July 5, 1906, responded at considerable length, making certain recommendations, to which reference will be made below. Under date of August 7, 1906, the President of the Borough of The Bronx transmitted a proposed rapid transit route in that borough extending northerly from a point near the Third Avenue Bridge through Willis avenue, Melrose avenue and the Boston Road to the City limits at Mt. Vernon. No communication has been received from the President of the Borough of Manhattan upon this subject.

Accompanying the communication from the President of the Borough of Brooklyn was sent a map indicating what, in his judgment, would be a suitable route to comply with the request contained in the resolution of your Board above quoted. This line begins in the Borough of The Bronx at Pelham Bay Park, and follows the Westchester avenue line already laid out by this Board and approved by your Board; then follows the Third avenue line heretofore laid out to the neighborhood of Delancey street and the Bowery, and at that point the line diverges. It is suggested that one branch shall cross the Williamsburg Bridge and follow the line of Broadway in the Borough of Brooklyn. The other branch will continue down the Bowery to Canal street, and then, crossing the Manhattan Bridge, follow the Flatbush avenue extension and Fourth avenue to Fort Hamilton, with a branch diverging near Thirty-eighth street and continuing to Coney Island. The line over the Williamsburg Bridge and along Broadway is included in Route No. 9, already submitted to your Board.

The routes over the Manhattan Bridge down Fourth avenue to Fort Hamilton and to Coney Island are also coincident, with routes laid out by the Rapid Transit Board and approved by your Board.

In the opinion of the Rapid Transit Board it would be inexpedient to include in the rapid transit subway system now under consideration a route to connect with the Williamsburg Bridge, and to proceed in the Borough of Brooklyn through Broadway to Jamaica avenue. Such a line, although serving a large population, and of very great importance, would more properly be connected with a system of loops serving either to unite the Williamsburg Bridge and Brooklyn Bridge, or the Williamsburg Bridge and the contemplated tunnels under the East river. As will be perceived by the map, it would diverge approximately at right angles from the general direction of the rapid transit system which is in contemplation, and for these reasons this Board would not recommend uniting in one contract, and as part of one system, the Broadway-Williamsburg Bridge line with a system connecting the northern part of the Borough of The Bronx with Fort Hamilton and Coney Island, and, perhaps, ultimately with the Borough of Richmond. A system so vast as that which is now in contemplation might easily be overloaded by adding to it divergent branches, however profitable these might ultimately prove to be.

With respect to the line proposed by the President of the Borough of The Bronx, it may be said that it parallels closely the White Plains Road branch, already laid out by this Board, as well as the Port Chester and the New York, Westchester and Boston roads, for which franchises have already been granted to private corporations. Moreover, if it should be determined to build such a line as the Borough President suggests, the whole scheme would necessarily be delayed for some considerable period. It would be necessary to survey and lay out the route, to obtain the approval of your Board to it, and probably to apply to the Supreme Court for its approval.

For these reasons the Rapid Transit Board would recommend as a continuous system of connected routes a rapid transit line following closely that suggested by the President of the Borough of Brooklyn in his communication to this Board of July 5, 1906. The line proposed would begin at Pelham Bay Park in the Borough of The Bronx, following Westchester avenue to the Southern Boulevard as an elevated road; thence as a subway west on

One Hundred and Thirty-eighth street to a point near the intersection of Lincoln avenue and East One hundred and Thirty-eighth street; thence under the Harlem river and Third avenue and the Bowery to the Battery. At a point near the intersection of the Bowery and Canal street a divergent branch is recommended to connect with the Manhattan Bridge, and then passing over the Manhattan Bridge and under Flatbush avenue extended to Fourth avenue, and thence southerly under Fourth avenue to Fort Hamilton. Near the intersection of Thirty-eighth street and Fourth avenue there would be another divergent branch extending under Fortieth street, New Utrecht avenue and other streets to a point in Eighty-sixth street near its intersection with Bay Thirty-fourth street, and from thence as an elevated railroad over Eighty-sixth street and Stillwell avenue to Coney Island.

The line thus recommended is shown on the accompanying sketch map. It will be observed that it constitutes a continuous system of connected routes in the Boroughs of The Bronx, Manhattan and Brooklyn, and affords the possibility of making provision for future extension under the Narrows from a point on Fourth avenue in Brooklyn. It complies also with the resolution of your Board by connecting with the Manhattan Bridge, Flatbush avenue and Fourth avenue to Fort Hamilton, "with a spur connection at Fortieth street for extension to Coney Island."

The whole of this line has already been laid out by this Board in the various routes heretofore submitted to your Board and approved by you. The portion of the route from Pelham Bay Park to a point near the Harlem river was originally adopted by this Board in June, 1905, but did not extend as far as Pelham Bay Park owing to the fact that the streets were not then laid out beyond Westchester Village. Subsequently a new street was laid out and placed upon the map or plan of The City of New York by your Board, and thereupon a new and extended route was adopted by this Board on May 17, 1906, and approved by your Board June 8, 1906, and by the Mayor June 14, 1906. Efforts have been made which it is thought will be successful to obtain the consent of the requisite number of property owners along this line.

From a point in the Borough of The Bronx near the Harlem river to the Battery the entire route was adopted by this Board on May 12, 1905, being known as route No. 3, was approved by your Board on July 14, 1905, by the Mayor on July 28, 1905. It was subsequently confirmed by the Appellate Division, First Judicial Department, although the formal order has not yet been entered.

For the portion running from the Bowery to the Manhattan Bridge, which is included in route No. 9, known as the Brooklyn and Manhattan Loop Line, Manhattan Section, commissioners were appointed some time since by the Appellate Division of the Supreme Court, but have not yet presented their report, although they have taken a large mass of testimony. The delay is due entirely to the opposition of property owners along certain portions of this route. This Brooklyn and Manhattan line was adopted by this Board on May 25, 1905, and approved by your Board on July 14, 1905, and by the Mayor on July 28, 1905. It is impossible to predict how soon the Supreme Court Commissioners may make their report in regard to this line, or what the report will be, or what may be the action of the Appellate Division in respect to it.

With respect to the portion of the line over the Manhattan Bridge and Flatbush avenue, extended, there is a physical difficulty, namely, that the bridge has not yet been constructed, and, as the Rapid Transit Board are advised, it will not be completed for probably at least two or three years to come. Under these circumstances no efforts have been made to obtain the consents of property owners along the proposed line, or in lieu thereof the consent of the Appellate Division of the Supreme Court. It is thought that there will be no difficulty in obtaining the requisite consents long before the bridge can possibly be finished.

The connection between the Manhattan Bridge line and the northerly end of Fourth avenue is a portion of the Manhattan and Brooklyn loop lines, already referred to as route No. 9, Brooklyn Section. In this case Commissioners were appointed by the Appellate Division in the Second Judicial Department and filed their report, but on motion of certain property owners the Appellate Division referred the matter back to the Commission to give an opportunity for the presentation of testimony, and that case is also still pending.

The route from the northerly end of Fourth avenue to Fort Hamilton, known as route No. 11, was adopted by this Board on June 1, 1905, approved by your Board on July 14, 1905, by the Mayor on July 28, 1905, and by the Appellate Division in the Second Judicial Department by an order entered June 18, 1906.

The route diverging from a point near Fourth avenue and Thirty-eighth street (Brooklyn) was adopted by this Board on June 7, 1906, approved by your Board June 15, 1906, and by the Mayor June 18, 1906. Subsequently efforts were made through the representatives of the property owners to obtain the consent of the requisite number to this route. On September 20, 1906, the Board received a large number of consents, said to amount to sixty-five per cent. of the value of the property along the route. Before the Board can determine whether these consents are legally sufficient it will be necessary to obtain certificates from a title company, and to examine as to the assessed valuation of the several parcels represented—a task which will occupy but a relatively short time.

From this review of the various links composing the proposed system it will be perceived that all the legal preliminaries have been completed with respect to the greater portion of the line, and that they are in process of being completed with respect to all the remainder except that part crossing over the Manhattan Bridge. As to this part, the necessary consents can no doubt be obtained long before the bridge itself is completed.

The resolution of your Board, to which this communication is a reply, contains a recommendation that the Rapid Transit System in question should be provided for in a contract which shall insure the operation of the entire system by one corporation—"whether said corporation be a private corporation or the corporation of The City of New York."

In a separate communication relative to the Lexington avenue and Seventh and Eighth avenue lines, the Rapid Transit Board has submitted to your Board some suggestions as to the best mode of dealing with the business problems that arise in connection with the effort to make a contract, or contracts, for construction, equipment, maintenance and operation of a rapid transit system. These suggestions so made apply with equal force to the comprehensive system now under discussion. If your Board thinks it desirable to do so, the Rapid Transit Board can (as soon as the remaining consents are obtained) prepare plans and specifications and advertise for bids for one contract to construct, equip, maintain and operate the entire system above described, or any part thereof; and at the same time invite bids for the construction of the separate sections composing it. The fact that the Manhattan Bridge is still under construction need not seriously embarrass the letting of the contract, because so far as that portion of the system is concerned, the contractor would only be called upon at most to lay wires and electrical conduits over the Bridge, the plans of which would, of course, be open to his inspection.

The cost of this complete system, from the Bronx to Fort Hamilton, including the Coney Island route, as suggested by the President of the Borough of Brooklyn (not including connection with the Williamsburg Bridge, and the Broadway, Brooklyn, branch) would be, in accordance with the estimate of the Chief Engineer, $57,000,000.

By a resolution of your Board, adopted July 19, 1906, the Rapid Transit Board was requested to consider and determine whether an elevated railroad should not be established over Delancey street, from the terminus of the Williamsburg Bridge to the Bowery, and thence along the Bowery to Park row, and along Park row to the entrance of the New York and Brooklyn Bridge; and the Rapid Transit Board was further requested to direct the immediate preparation of plans and a form of contract for the construction of a rapid transit railroad through a part of Route No. 9 already referred to, known as the Brooklyn and Manhattan Loop Line.

These matters are receiving the attention of the Board, and a communication to your Board will shortly be sent to it, advising you of the action taken by us upon these subjects. In connection with them this Board may be able to deal with the question of the proposed line under Broadway, Brooklyn, to the Williamsburg Bridge. As already stated, it is the judgment of this Board that the Broadway line ought to form a part of the system which it was originally planned to connect with, namely, the general and comprehensive Brooklyn and Manhattan Loop Line.

THE BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS FOR THE CITY OF NEW YORK.

A. E. ORR, President.

BION L. BURROWS, Secretary.

On December 7, 1906, the Board of Estimate and Apportionment recommended that alternative bids should be invited for this route also upon the same terms as the other routes above referred to, namely: first, for construction alone, and, second, for construction, equipment and operation. As an essential part of this road was included in the Brooklyn and Manhattan loop lines route in which the commissioners in Manhattan had not reported and in which, of course, orders of confirmation had not been entered by the courts, it was impossible for the Board, during the year, to take the subject into practical consideration.

II.

GRANTS OF FRANCHISES.

NEW YORK CONNECTING RAILROAD COMPANY.

As stated in the report for 1905 a new application for a franchise was submitted by this Company, under date of November 16, 1905, which was the subject of extended discussion between the Board and the officials of the railroad company, without any agreement having been reached. One reason for the delay in considering this application was that the constitutionality of the legislation which took from the Board of Aldermen the power to deal with such matters was still before the courts, and the matter was not decided by the Court of Appeals until April 24, 1906. In the meantime the Board of Aldermen had adopted resolutions requesting the Board of Estimate and Apportionment, if that body should ultimately be held to be the one which could constitutionally give the municipal consent to the grant of the franchise, to withhold such consent unless the conditions theretofore insisted upon by the Aldermen should be made a part of the conditions of the franchise.

Without awaiting the action of the Court of Appeals, however, the Committee on Plans and Contracts of the Board, to whom the matter had been referred, reported on March 1, 1906, the form of a certificate to the New York Connecting Railroad Company in which the payments to be exacted from that company were to be very much larger than those contemplated in the former certificate. It was proposed that there should be an initial payment of $100,000, and that the company should pay $25,000 a year for the first ten years and $50,000 a year for the next fifteen years, with certain additional payments for the right of crossing lands under water and the lands of The City in Randall's and Ward's Islands. At the end of twenty-five years the compensation to be paid The City was to be the subject of readjustment. These terms were, however, criticised as being inadequate, and, after discussion, the proposed certificate was recommitted to the Committee on Plans and Contracts with instructions to confer with a committee of the Board of Estimate and Apportionment, when appointed, with regard to this subject.

Such a committee was appointed by the Board of Estimate and Apportionment. Although requested by the Rapid Transit Board on several occasions to fix a date for a meeting for the purpose of conference, they failed to do so. The subject therefore remained in abeyance during the year.

NEW YORK AND JERSEY RAILROAD COMPANY.

In accordance with the terms of the certificates issued to this company, the plans for a terminal station at Thirty-third street and Sixth avenue were presented to the Board in March, 1906. This station, as planned, is to occupy the entire block between Thirty-second and Thirty-third streets on Sixth avenue, extending back a distance of four hundred feet. Upon this plot, equivalent to thirty-two ordinary city lots, the Company proposes to erect a large building many stories in height over the station, which is to be situated in the basement.

The suggestion of such a building involved some embarrassment, because by the certificate of February 2, 1905, the City retains the right to purchase (at any time after twenty-five years) the whole line on Sixth avenue including "stations, real estate, and any and all easements, structures and property connected therewith." If the City should ever buy the Sixth avenue railroad as part of a rapid transit system, it would certainly have no use for this terminal station. It was therefore desirable, before approving the plans, to remove any doubt on the question whether the City would have to buy this large building in case it should buy the road. Accordingly an agreement was arrived at with the New York and Jersey Railroad Company by which the original certificate was modified so as to provide in plain terms that in case the City should exercise the right or option to purchase the Sixth avenue line, the property to be taken should include all stations south of Thirty-third street, but that it should not include so much of the terminal station at Thirty-third street as was located within the Company's own private property. The City, however, reserved the right or option to purchase so much of the station lying within the private property as it might need, at a valuation to be fixed by arbitration. A copy of the agreement of modification is printed in an appendix to this report.

In accordance with the original certificate the Company submitted plans for certain stations with exits through private property. These proposed stations are as follows: At Greenwich and Hudson streets, with an entrance through private property; at Sixth avenue and Fourteenth street, with an entrance through the property known as The 14th Street Store; at Sixth avenue and Nineteenth street, with an entrance through the Siegel-Cooper store on the east side and through the Simpson-Crawford Company store on the west side, and at Sixth avenue and Twenty-third street, with an entrance through the store of James McCreery & Company. This left several station entrances still to be arranged for. On November 21, 1906, the Company addressed a communication to the Board asking leave to make entrances to the west side platforms at Fourteenth and Twenty-third streets, and to both platforms at Twenty-eighth street by using for head room the space under the present elevated railroad stairways at those points, and offering to pay reasonable compensation to the City for the stairways in question.

The Board approved the entrances through private property as arranged by the Company, but the application for leave to construct stairways to the surface involved some serious questions which were still under consideration by the Board at the end of the year.

Under date of December 1, 1906, the New York and Jersey Railroad Company was consolidated with the Hudson and Manhattan Railroad Company and Hoboken and Manhattan Railroad Company of New Jersey, under the corporate name of Hudson and Manhattan Railroad Company. The agreement of consolidation between those companies substantially provided for the assumption by the new company of all the obligations incurred under the certificates granted to the constituent companies by The City of New York.

HUDSON AND MANHATTAN RAILROAD COMPANY.

The plans for the construction of the Church street terminal station of this company were submitted to the Board at various times during the year, and on December 13, 1906, the detailed plans were approved by the Board.

ADDITIONAL TRACKS UPON ELEVATED RAILROADS.

The report of this Board for the year 1905 stated that the Interborough Company had applied for authority to construct a third track upon the Second and Third avenue elevated railroads in Manhattan and The Bronx; that this application had received the careful consideration of the Board; and that as the result of the full examination of the subject it had been determined to postpone any decision upon the application until after the Harlem river tunnel section of the rapid transit railroad had been completed and put in operation. Operations began upon that section on July 10, 1905, but the subject of the elevated railroad tracks was not again brought to the attention of the Board until near the close of the year 1906. On November 1st, a very full hearing was had upon which the following associations were represented:

The Joint Rapid Transit Committee of the Civic Associations of The Bronx,

The Taxpayers' Alliance of The Bronx,
The Northside Board of Trade,
The Bronx Real Estate Brokers' Association,
The Twenty-third Ward Property Owners' Association,
The South Bronx Property Owners' Association,
The Harlem Property Owners' Association,

and certain Brooklyn interests appeared in favor of the application. Against it appeared:

The People's Institute,
The Civic Club,
The Merchants' Association of New York,
The Municipal Art Society,
The East Side Civic Club,
The Transit Reform Committee of One Hundred.
The Bronx Civic League,
The Woman's Health Protective Association,
The Woman's Municipal League,
The University Settlement Society,
The National Consumers' League,
The New York City Consumers' League,
The College Settlement,
The Normal College Alumnæ House,
The Jacob A. Riis Neighborhood Settlement,
Calvary House,
and certain citizens and taxpayers of the Borough of The Bronx.

The Board took no action upon the subject.

NEW YORK CENTRAL & HUDSON RIVER RAILROAD COMPANY, WEST SIDE TRACKS.

On March 26, 1906, an act of the Legislature entitled, "An Act to Terminate the use of Streets, Avenues and Public Places in The City of New York in the Borough of Manhattan by Railroads Operated by Steam Locomotive Power at Grade," was approved by the Governor. This act directed the Rapid Transit Board to prepare as speedily as possible a plan for the removal of tracks on railways operated by steam locomotive power in the

Borough of Manhattan which were laid along or across any public streets, avenues or public parks at grade. An agreement was to be made with any railroad company or companies which operated such a railroad by steam locomotive power at grade for the construction by such railroad company or companies, at its or their own cost, of a subway either under the roadbed of their present tracks or under such other streets, avenues or public or private property as might be agreed upon. Every such agreement was to provide as a condition and as part of the consideration therefor, that all present franchises of every kind upon the streets where the railroad was operated at grade should be surrendered and cancelled and the tracks removed therefrom at the cost of the railroad company or companies.

Additional franchises might be granted to lay in said subway such additional tracks as might be agreed upon. In case the Board should be unable to agree with any such railroad company within twelve months after the act took effect, the Rapid Transit Board was required thereupon to condemn "all and any rights, privileges and franchises of any such railroad company or companies to operate by locomotives using steam or other power, cars or trains for carrying freight and passengers at grade on, across, through or along streets, avenues, public parks or places in The City of New York, Borough of Manhattan." For this purpose the Board was to prepare three sets of maps showing the location of the tracks to be removed, and after filing such maps the Board was to direct the Corporation Counsel to take legal proceedings to acquire by condemnation all the valid or lawful franchises of any such company to operate such tracks at grade.

This act, although general in terms, applied in fact only to the tracks of the New York Central Railroad Company upon Eleventh avenue, West street and other streets in Manhattan. Immediately upon its passage the Board instructed its Chief Engineer to undertake studies of the locality with a view to preparing plans for the construction of the subway contemplated by the act. The officers of the New York Central Railroad Company very readily placed at the disposal of the Board all the information which they possessed, and in addition the Board caused to be made careful surveys and borings so as to ascertain the nature of the soil and the possibility of constructing a subway at the various points between Spuyten Duyvil and St. John's Park, to which the act related.

The necessity for a careful study of the exceedingly difficult problem presented by the terms of the act, prevented the preparation or submission of any report which should adequately deal with the subject until the autumn of 1906. Under date of November 14, 1906, the Chief Engineer presented a comprehensive report dealing with the subject.

Beginning at Spuyten Duyvil Creek and going south to Seventy-second street, the tracks of the New York Central Railroad are located on their own right of way except at the points where its tracks cross intersecting streets, and on Twelfth avenue, between 141st and 135th streets, where title has been acquired by the City. The tracks cross at grade the following streets which have been regulated, graded and paved and are now in use, viz.: Dyckman street, Depot Road (177th street), 165th street, 158th street, 155th street, 151st street, 145th street, 138th to 129th streets, inclusive, 96th street, 79th street. From 72d street to 61st street the tracks are on the right of way of the company. From 61st street to 33d street the tracks are on the surface of Eleventh avenue. From 33d street the main tracks run diagonally across the blocks to Tenth avenue, near 30th street, crossing 32d and 31st streets at grade. From 30th street to Bloomfield street the tracks are on the surface of Tenth avenue, and from Bloomfield street to Canal street the tracks are on the surface of West street. There they turn east on Canal street and run from Canal and Hudson streets into the yard at St. Johns Park. From 72d to 59th street all of the space between the main tracks and the river is occupied by the railroad yard, the intersecting cross streets for this distance having been closed by an act of Legislature. From 30th street to 37th street there is also an extensive railroad yard.

It is quite obvious that two separate problems are presented. North of the 59th street railroad yard the railroad runs upon its own right of way and not upon a street, and simply crosses at grade several intersecting streets. It is built practically at the river's edge and the rails lie at a very slight elevation above high tide. It would therefore be an extremely expensive task to place the tracks in a subway under the various cross streets above referred to, and as the relief to which the City is unquestionably entitled could be had in a much better and more practical manner by other means, the Chief Engineer suggested that the grade of the railroad should in general remain as it is from 72d street to Spuyten Duyvil Creek, and that the streets should be raised so as to pass over the railroad. This, however, would not be practicable at the so-called Manhattan valley from 129th to 138th street. At these points the Chief Engineer proposed that the railroad tracks should be elevated, leaving the streets at their present grade. His plans, of course, would involve the necessity for an amendment of the act.

South of the railroad yard at 59th street the tracks run not simply across the various streets of the City, but directly along such streets, occupying the centre of the roadway and constituting a very objectionable feature. These tracks could, as an engineering matter, be removed and placed in a subway, the cost of which for construction alone would, as estimated by the Chief Engineer, amount to somewhere between $29,700,000 and $33,150,000, according to which of two routes was adopted. In addition to this, an estimated additional expenditure of $850,000 would have to be incurred for the reconstruction of present connections to river piers and private enterprises, besides acquiring private property at various places, the cost of which it would be impossible at this time to ascertain. The Chief Engineer also pointed out certain practical difficulties involved in switching freight cars in a tunnel.

This report, which was accompanied by complete maps and plans, was sent to the New York Central Railroad Company for its examination, but up to the close of the year no agreement had been come to with that company. The time for making such an agreement, as stated above, will not expire until March 26, 1907.

NEW YORK, NEW HAVEN & HARTFORD RAILROAD EXTENSION.

On June 5, 1906, the New York, New Haven & Hartford Railroad Company presented an application to the Board, asking for authority to construct and operate a road to connect its main line from a point near Woodlawn in the Borough of The Bronx with a point near its Harlem River extension at or near the West Farms station. The subject has been the matter of some conference with the officials of the New York, New Haven & Hartford Railroad Company, and terms for the franchise were tentatively agreed upon. The Company has not, however, complied with the suggestion of the Committee of the Board to furnish further details, and the Board has therefore come to no conclusion in regard to the matter.

LONG ISLAND RAILROAD COMPANY.

Under date of October 18, 1906, the Long Island Railroad Company presented two applications to the Board for short connections in the Borough of Queens. These applications were also the subject of some discussion and the general outlines of a certificate were agreed upon, the only point remaining being the compensation to be paid to the City for the privileges desired. In view of the fact that the subject of proper compensation in such cases was still a matter of discussion in the case of the New York Connecting Railroad Company, the Board has deferred action upon the Long Island Railroad applications.

BEHR MONORAIL RAILWAY COMPANY.

Under date of January 10, 1906, Mr. F. B. Behr presented an informal application to obtain a franchise to build a railway starting from Atlantic avenue in Brooklyn and running to Coney Island. The plans of Mr. Behr contemplated the construction of a railroad upon an entirely different system from that in ordinary use. The cars would run upon a structure having a triangular section and bearing upon the top of a single rail. Upon this rail the weight of the cars would rest, being supported by a series of vertical wheels placed under the centre line of the cars. In order to prevent the cars from overturning, rails are placed upon the sides of the triangular structure against which numerous guide wheels are pressed by strong springs. It is claimed that very great speed—as much as one hundred miles an hour—could be obtained upon such a railroad.

It is obvious that serious questions would be presented if the Board should adopt any such form of construction. The subject has received careful consideration by the committees of the Board, and hearings have been held in regard to it.

III.

PROGRESS ON MANHATTAN-BRONX RAILROAD DURING 1906.

PAYMENTS FOR THE WORK.

The report of the Chief Engineer hereto appended sets forth fully the progress made in the work of construction during the past year:

The total amount expended for regular work done and materials furnished under the contract up to January 1, 1907, was	$34,483,000.00
In addition to this is the expenditure for extra work, contract No. 1, amounting to date to	2,883,389.50
And the expenditure for ducts, contract No 1, amounting to date to	1,415,886.58
Making a total expenditure for work and materials under contract No. 1 to date, of	$38,782,276.08

For details of these and all other expenditures of the Board, the reports of the Auditor and Chief Engineer should be consulted.

EARNINGS AND RENTAL.

The following table shows the gross receipts, operating expenses and net earnings of this line for the whole period from October 27, 1904, to December 31, 1906, as furnished by the Interborough Company to the Comptroller:

Statement of Earnings.

October 27, 1904, to December 31, 1906.

	Gross Receipts.	Operating Expenses.	Profits.
From Oct. 27 to 31, 1904	$64,700.00	$30,433.79	$34,266.21
November, 1904	314,554.25	189,420.12	125,134.13
December, "	447,349.05	243,300.00	204,049.05
Totals for 1904*	$826,603.30	$463,153.91	$363,449.39
January, 1905	$540,572.98	$246,501.96	$294,071.02
February, "	529,796.83	223,549.43	306,247.40
March, "	490,721.80	225,715.63	265,006.17
April, "	495,126.38	233,479.52	261,646.86
May, "	482,710.73	241,614.30	241,096.43
June, "	365,840.25	226,144.77	139,695.48
July, "	302,525.60	204,766.61	97,758.99
August, "	345,462.55	212,369.53	133,093.02
September, "	432,685.94	211,251.43	221,434.51
October, "	542,668.57	234,302.88	308,365.69
November, "	607,893.95	234,610.04	373,283.91
December, "	671,520.50	249,154.20	422,366.30
Totals for 1905†	$5,807,526.08	$2,743,460.30	$3,064,065.78
January, 1906	$668,269.17	$257,406.57	$410,862.60
February, "	616,182.33	231,874.61	384,307.72
March, "	680,550.96	256,382.50	424,168.46
April, "	633,974.18	254,260.12	379,714.06
May, "	599,426.35	271,593.32	327,833.03
June, "	490,422.73	257,420.45	233,002.28
July, "	415,138.34	256,044.62	159,093.72
August, "	400,188.62	259,261.44	140,927.18
September, "	481,601.71	271,049.12	210,552.59
October, "	656,484.63	302,877.69	353,606.94
November, "	696,765.79	313,622.42	383,143.37
December, "	741,502.60	323,729.16	417,773.44
Totals for 1906‡	$7,080,507.41	$3,255,522.02	$3,824,985.39

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*This line was opened to Broadway and 145th street on Oct. 27, 1904; to Broadway and 157th street, Nov. 5, 1904; to Lenox avenue and 145th street, Nov. 23, 1904; from Third avenue and 149th street to 181st street, Nov. 26, 1904.

†The portion from Lenox avenue and 142d street to Third avenue and 149th street was opened for traffic on July 10, 1905.

‡The portion from Broadway and 157th street to the Harlem Ship Canal was opened for traffic (except as to the 168th and 181st street stations) with shuttle trains, on March 12, 1906; the above stations were finished and shuttle trains discontinued on May 30, 1906.

The following statement shows the payments of rental made by the Company to the City during the period from October 27, 1904, to December, 1906. It is proper to state that the payment of the additional one per cent. upon the amount of bonds outstanding made for the first year was made under protest by the company inasmuch as they claimed that under a proper construction of the contract they were exempted from making this payment. Nevertheless no legal proceeding by the company has been brought to recover this payment.

RENTAL PAYMENTS TO THE CITY.

October 27, 1904, to December 31, 1906.

Interest on bonds, Oct. 27, 1904, to March 31, 1905..	$533,144.87	
" " " June 30, 1905....................	260,344.78	
" " " Sept. 30, 1905..................	344,488.98	
		$1,137,978.63
Payment on account of Sinking Fund, Oct. 27, 1904, to Oct. 31, 1905..............................		384,576.79
Interest on bonds, Dec. 31, 1905....................	$334,257.55	
" " " March 31, 1906..................	341,816.27	
" " " June 30, 1906..................	370,186.22	
" " " Sept 30, 1906..................	370,086.54	
		1,416,346.58
Payment on account of Sinking Fund to Oct. 31, 1906..............		425,799.78
Interest on bonds due Dec. 31, 1906..............................		369,926.18
Total..		$3,734,627.96

The rent paid on this line during the first complete year from October 27, 1904, to October 31, 1905, was therefore $1,522,555.42; and during the second complete year was $1,842,146.36.

OPENING OF ROAD FROM 157TH STREET NORTH.

As stated in the report for 1905 the work of constructing the railroad in Washington Heights was very much delayed by reason of the dangerous nature of the work, especially at the deep stations at 168th and 181st streets, where bad spots were found in the rock. At the beginning of the year 1906 the tunnel was substantially completed with the exception of the two stations referred to, and the elevated structure from Fort George to the Ship Canal had long been ready for operation. On March 1, 1906, the Chief Engineer reported that the road was in such condition that it was possible to operate trains with safety as far as the Harlem Ship Canal, although the 168th and 181st street stations were still not entirely ready for use. Accordingly a service by shuttle trains was inaugurated on March 12, 1906. Shortly afterwards those two stations were completed and the shuttle train service was discontinued, through trains running to the end of the line.

The opening of those two stations was followed immediately by a very large public use, and the residents in that district expressed an earnest desire to have escalators introduced instead of elevators, but there are serious practical difficulties in the way of installing escalators. The congestion has been especially great at 168th street and Broadway owing to the fact that the American League baseball grounds are situated close to this station, and on December 21, 1906, the Board of Aldermen adopted resolutions urging the Rapid Transit Commission to take under advisement the subject matter with the view to the construction of additional elevators or escalators at the 168th street station so as to relieve the conditions at that point. The subject will continue to receive the attention of the Board.

SHIP CANAL BRIDGE.

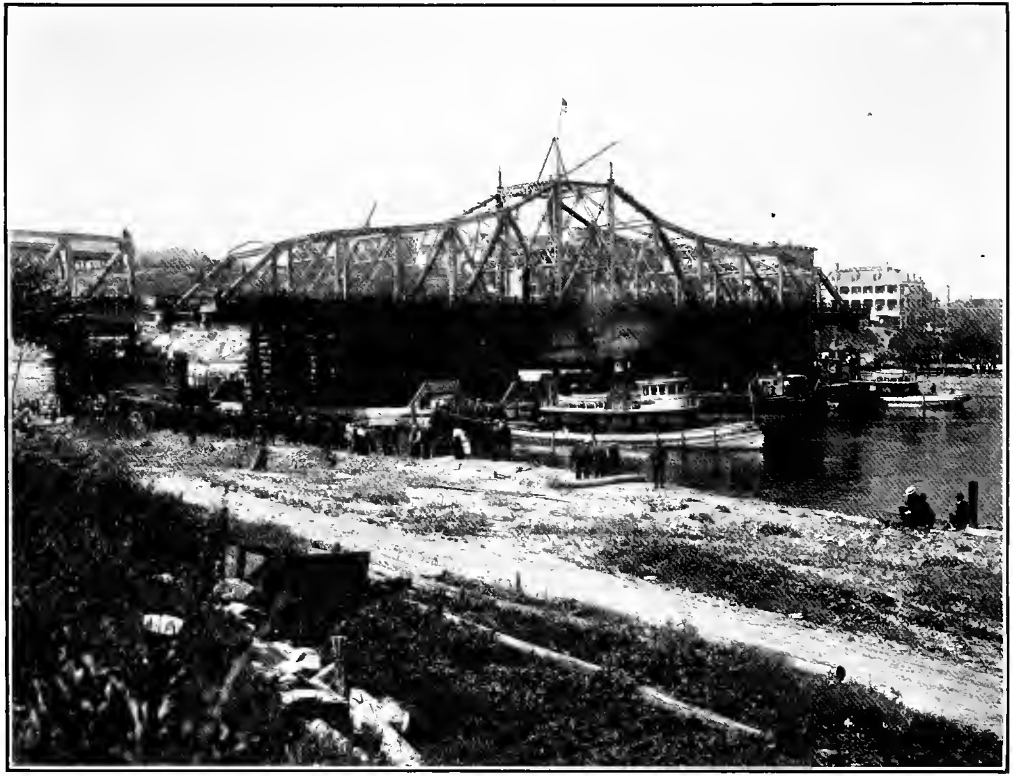
As heretofore reported, an agreement was arrived at between the City, the Interborough Company, the New York Central & Hudson River Railroad Company and the Metropolitan Street

Railroad Company to remove the old bridge at the Ship Canal and replace it across the Harlem River at 207th street, while an entirely new bridge structure with new abutments at the north end was to be constructed over the Canal. This novel and difficult engineering task was successfully carried out in June, 1906. On Friday, June 14th, the old draw span was lifted from its position and carried to 207th street, where it was set in place as a part of the new bridge, the draw being turned by steam from its own boiler on the night of the same day. Two days later the new draw span was put in place at the Ship Canal bridge and one roadway of the bridge was immediately opened for traffic.

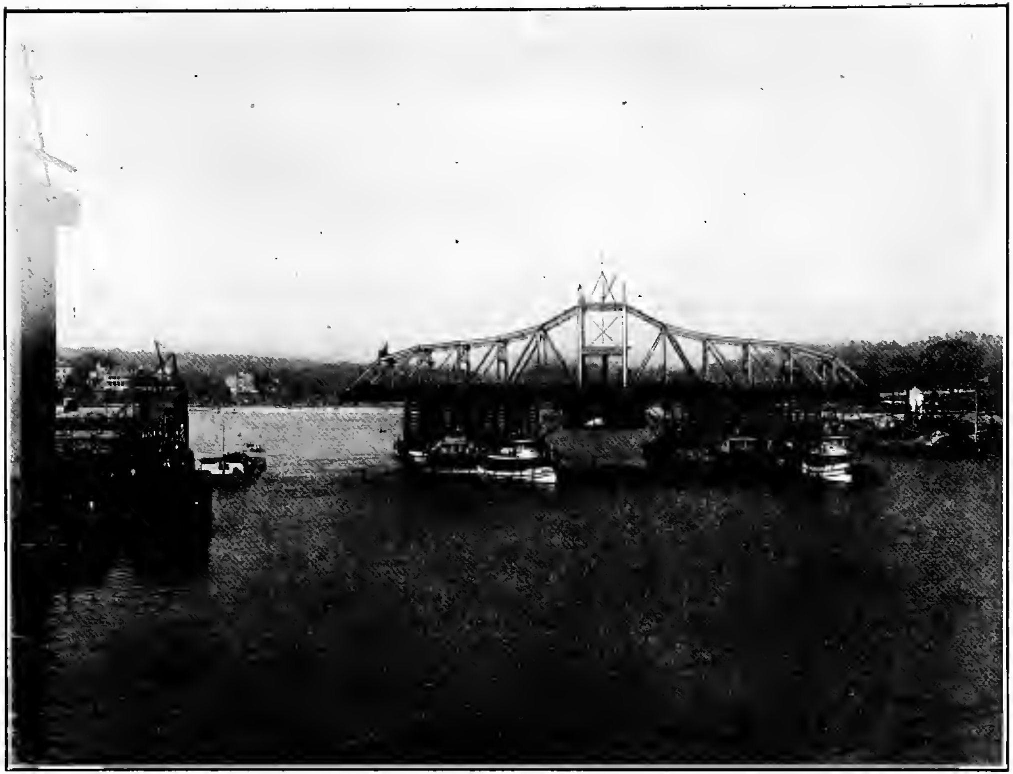
VAN CORTLANDT PARK EXTENSION.

The original plans for this railway contemplated that it should end at a point near the Kingsbridge stations of the New York Central Railroad. Subsequent to the letting of the contract for construction the question of extending the road to Van Cortlandt Park had been several times under consideration and finally the Board adopted general plans for such an extension. This route and general plans were approved by the Appellate Division of the Supreme Court with other routes, as already stated, in July, 1906; but the formal order embodying this decision was not entered until October 18.

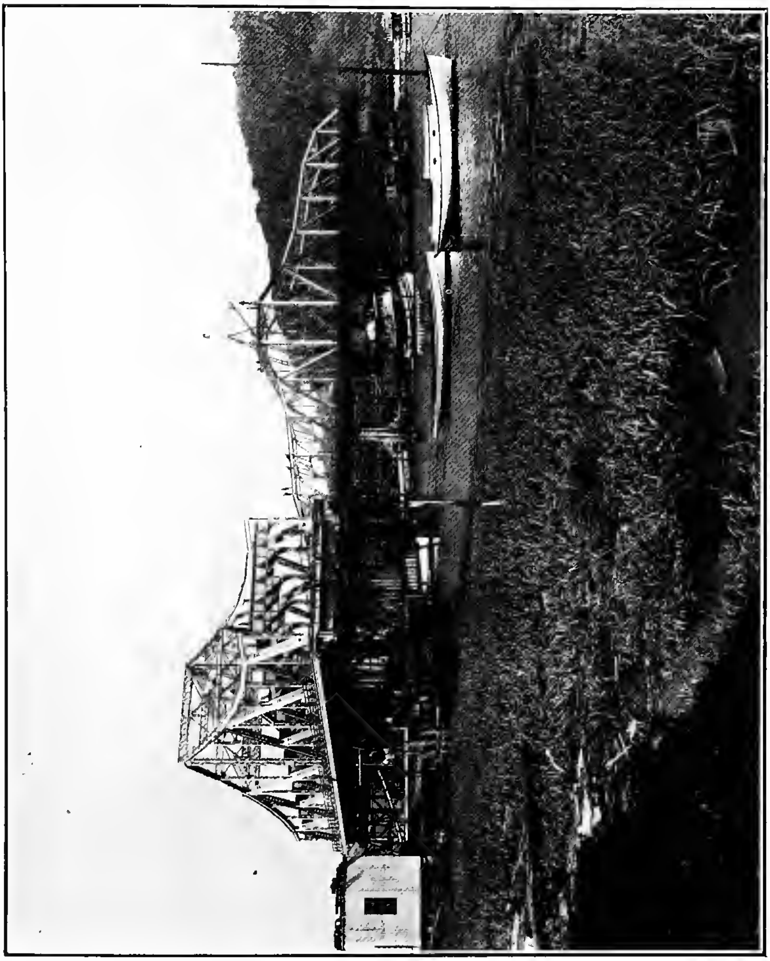
In anticipation of the entry of the order, the subject of a contract with the Interborough Company to extend its line was taken up during the Summer. The Company was anxious to build the road, but some questions were raised as to the price to be paid. The Board ultimately agreed that this construction should be treated as extra work under the original contract, and an agreement to that effect was made and was consented to by the Board of Estimate and Apportionment on November 23, 1906. The cost of this work was estimated at $675,000, and bonds to that amount were authorized by the Board of Estimate and Apportionment. The work of construction is now in progress and should be completed early in the Autumn of 1907.



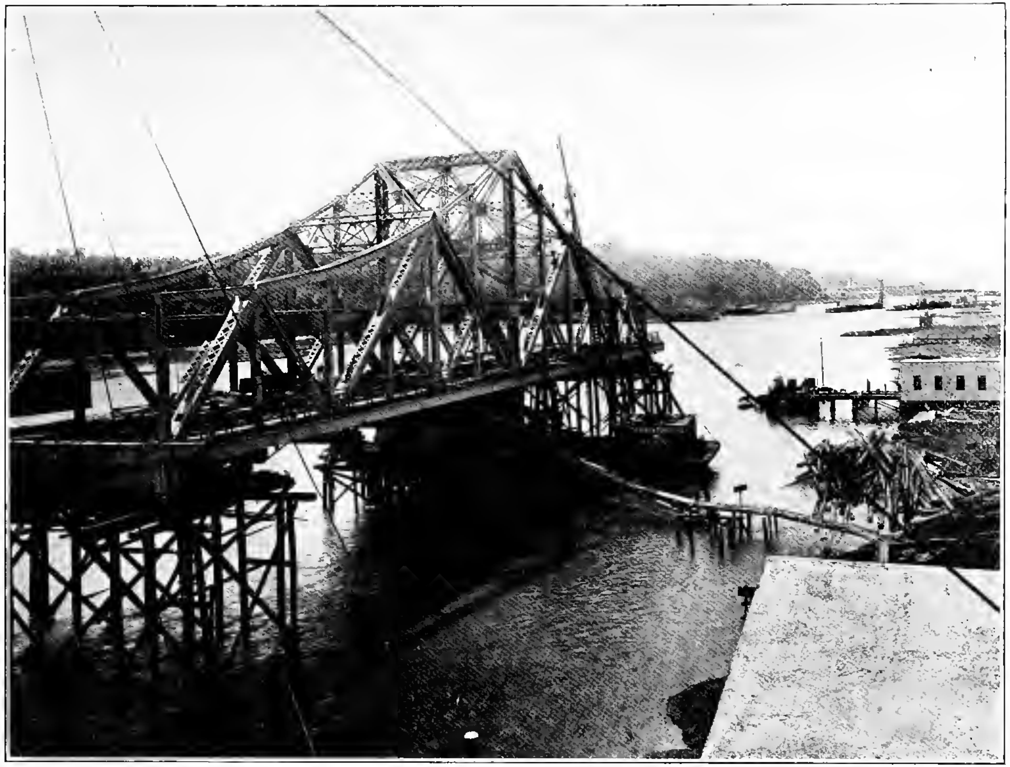
Harlem Ship Canal—Towing Old Draw Span from Centre Pier.



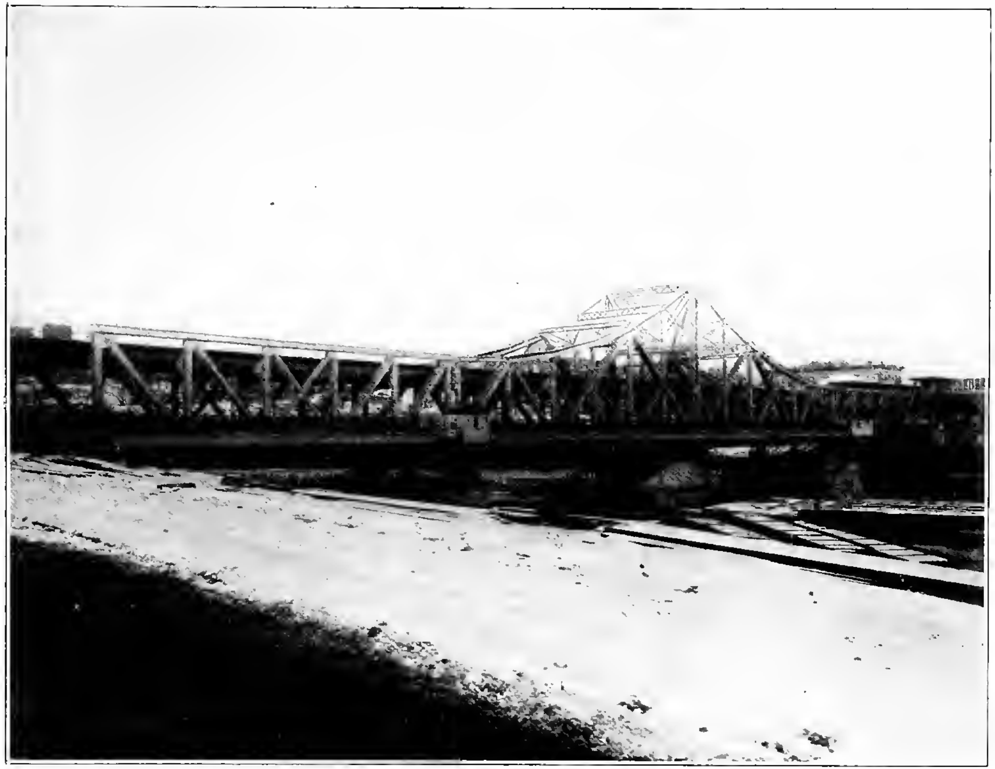
Harlem Ship Canal—Floating Old Draw Span Down the River to Two Hundred and Seventh Street.



Harlem Ship Canal—Old and New Draw Spans.



Harlem Ship Canal—New Double-Deck Draw Span on False Work.



Harlem Ship Canal—Double-Deck Bridge Completed.

COMPLAINTS OF INADEQUATE SERVICE.

From time to time various complaints have been made to the Board that the contractor had failed to carry out the covenants of the contract of February, 1902, by which it agreed to "meet all reasonable requirements of the public in respect of the frequency and character of its railway service to the full limit of the capacity of the railroad." The subject was carefully investigated by a committee, which presented the following report:

March 22, 1906.

Hon. A. E. ORR, *President, Rapid Transit Board:*

DEAR SIR—Pursuant to the following resolution passed by the Board at its last meeting you appointed a committee consisting of the Comptroller, Commissioner Claflin and the Chief Engineer to report in accordance therewith.

"Resolved, That a committee of three be appointed by the President of the Board of Rapid Transit Railroad Commissioners to investigate the question of frequency and efficiency of service in the subway, and to report back to this Board such suggestions as may be found necessary and suitable to be required of the Interborough Rapid Transit Company, now operating the cars in the subway, looking to the improvement of the train service."

As soon as practicable, therefore, the Engineering Department made some observations, commencing on Saturday morning, March 3, at 8 o'clock, and continued them without intermission until 8 o'clock on Wednesday morning, March 7. Saturday, March 3, was a rainy day, while on Sunday, Monday, Tuesday and Wednesday fair weather prevailed.

Vice-President E. P. Bryan of the Interborough Rapid Transit Company has furnished the following as the number of tickets sold on the separate days, from which it will be seen that the sales on Monday were extraordinarily large, probably the largest day's sales since the operation of the road:

	Total Ticket Sales at All Stations.
Saturday, March 3	446,884
Sunday, March 4	280,081
Monday, March 5	539,248
Tuesday, March 6	478,605

The data obtained is voluminous, covering over 3,000 sheets of record, and this has been worked out in a graphical way, by sheets and diagrams furnished with this report. These sheets cover the express and local service on all the days of the observations.

The train movement has been compared with the schedule instituted by the Interborough Rapid Transit Company on December 27, 1905. The number of cars in trains and the approximate number of passengers carried are represented on the charts, the diagrams indicating the average condition of each car in all the trains run within the hour.

A car seats 52 passengers. For convenience in making the charts the condition of a car was estimated to the nearest one-third full, or, when people were found standing, the estimated number of standers was noted in the same manner. A glance at the chart shows that the portion of the diagram cross-hatched represents the condition of the car between empty and full, the standers being represented by solid shading.

The conclusions drawn from these observations are as follows:

First—It is clearly apparent that passengers do not properly distribute themselves through the trains at any hour of the day, the end cars being less crowded than those in the centre, and in many instances the central cars are crowded with standers while there are seats vacant in the end cars.

Second—In the Sunday train service it is shown that either north or southbound express trains during some portion of their run south of Ninety-sixth street station carry passengers standing.

On Sundays the express trains are five-car trains. In order to provide adequate service on Sundays, it appears that seven or eight-car express trains should be run during the whole Sunday schedule, and a close study of the observations which have been made shows that, in order to accommodate the churchgoers on Sunday, the express train service should be begun at an earlier hour.

Third—The local service on Sundays seems to be very nearly a proper service, particularly if the suggested changes in the express service, as stated above, should be carried out. We noticed that the scheduled and observed number of trains running at all hours corresponded closely, and in some cases other trains were interjected with an idea of meeting the fluctuating movements of the public. From two o'clock in the afternoon until midnight on Sunday the Lenox avenue locals are generally in a crowded condition. The Broadway locals during the same hours carry fewer passengers and are not crowded. The Lenox avenue locals on Sunday afternoons run at about six-minute intervals. To provide adequate service, it is obvious that the number of trains should be increased.

Fourth—In respect to the week day service, it is noticeable that in the express service, from early morning until nine o'clock at night, either north or southbound express trains for some portion of their run below Ninety-sixth street carry standing passengers. Between the hours of 7 and 9 a. m. and 5 and 7 p. m., express trains are run approximately at the smallest interval practicable, and are filled with passengers to their maximum carrying capacity; in one case as many as eighty passengers have been carried in a half car during such hours, or 160 passengers to a car. During these hours it seems almost impracticable to provide any better service. During the other hours of the day, both morning and afternoon, the express train service has been reduced, ranging from a six-minute interval between 6 and 7 in the morning and 7 and 8 o'clock in the evening, and a little less than a three-minute interval between 9 and 10 in the morning and 4 and 5 o'clock in the afternoon, for eight-car trains. Between 7 and 8 p. m. some of the expresses are reduced from eight cars to five cars, and after 8 p. m. approximately all express trains are reduced to five cars. To provide adequate service for express trains, therefore, eight-car trains should be maintained throughout the day from 6 o'clock in the morning until 9 o'clock at night, and more express trains should be run through the day until one o'clock at night than the schedule now provides for.

Fifth—As to the local trains on week days, between 7 and 9 o'clock in the morning southbound Lenox avenue cars and all southbound locals below Grand Central Station are crowded. Between 5 and 7 o'clock in the evening all locals north of Grand Central Station and all Lenox avenue locals are crowded, these, of course, being in the rush hours, and the interval between trains is a little over two minutes. It seems to us that the running of the local trains during rush hours should be increased; at all other hours of the day the local service seems to be adequate.

We have noticed that it is often the practice of the guards at the forward end of the trains when at stations, when no passengers are directly opposite the doors, to close them before the bell has been rung starting the trains, and it is quite frequent to see people who are crowding around the doors of the middle part of the train rush to the forward doors and find themselves shut out, and in that way very often lose their opportunity to board the train.

We have also observed that at certain times expresses are withdrawn and that no notice of the same can be obtained from any attendant on the platform, more particularly late at night, and think that when the express service is discontinued notices should be put up at the express stations so informing the public.

Respectfully submitted,

H. A. METZ,
(Signed) JOHN CLAFLIN,
GEORGE S. RICE.

These suggestions were transmitted to the Interborough Company, which substantially adopted them.

On and after June 18, 1906, it was arranged that all Lenox avenue express trains should run through to the West Farms station instead of stopping at 145th street and Lenox avenue, as some of them had done previous to that time.

Late in the year a number of residents of the Washington Heights neighborhood urged that the third track between 96th and 145th streets should be used for express service rather than for the storage of cars. The officials of the Interborough Company pointed out certain difficulties in connection with this request which they believed would exist, arising principally from the fact that the two branches of the subway came together at 96th street and that to carry out the schedule then in force a train arrived at that station every minute from the north, and at the same rate from the south.

This large traffic results in a congestion of trains waiting to enter the station, so that it is not practicable to increase the train service above 96th street. In order to utilize the third track for express service between 96th and 145th street stations the number of local trains must be decreased in direct proportion to the number of through express trains provided, and this was certain to result in still greater train congestion for the reason that it would involve switching from the central track into a local track at two points—one south of 145th street and the other just south of 103d street. The net result would therefore be that while the total service north of 96th street can not be increased, a division of the service would improve the conditions north of 145th street with some detriment to the service from 103d to 137th streets inclusive.

There were some other practical difficulties with regard to switching at 145th street which would be removed if the switch were placed south of 137th street. The Board, therefore, to bring the matter to a practical test, resolved that the Interborough Company should run express trains between 96th and 137th streets. The result of these express trains up to the close of the year seems to bear out the prevision of the Board and to make it probable that the building of additional side tracks north of the 96th street station will have to be undertaken within some reasonable time.

Certain complaints have also been received by the Board in regard to the Westchester avenue connection at 149th street and Third avenue. The residents of the district east of Third avenue, which is served by the subway extension, are anxious to have the Third avenue elevated trains run over this extension so as to avoid a change of cars. Such a transfer, although free, involves using very long stairs to go from the subway station to the elevated railroad station at the point of crossing. The difficulty in the way, as alleged by the Interborough Company, is that the number of elevated railroad trains using Third avenue is so great that it would be impossible to carry on the business during the rush hours if additional trains coming from Westchester avenue should be injected into the service.

The difficulties at this point have also been aggravated by the fact that since the construction of the subway station the City authorities have widened 149th street without making any provision for the removal of the subway stairs, and the conditions of transfer are in consequence somewhat objectionable. It is believed, however, that with the construction of additional subways the complaints now made will largely disappear, and the matter of the subway stairs is one of easy adjustment if the City authorities having the control of the streets desire that they shall be removed from their present position.

JURISDICTION OF CITY DEPARTMENTS.

In connection with the matter of the stairway at 149th street it may be stated that some question has frequently arisen as to the jurisdiction of the various departments of the city government over rapid transit railway structures or equipment. Prior to the year 1906 those matters had been adjusted without any serious difficulty, although without any written expression of opinion by the Corporation Counsel.

The matter, however, assumed a serious phase during the month of June, 1906, when one of the inspectors who was employed to supervise some construction work at Broadway and 137th street, was arrested upon the ground that no permit had been granted by the Borough President of Manhattan. The attention of the Corporation Counsel having been called to the matter, he addressed a communication to Mr. Ahearn, the Borough President, under date of June 19, 1906, in which the subject was fully discussed and the conclusion reached that the Board of Rapid Transit Commissioners alone had control with respect to the construction, equipment, maintenance and operation of the subway railroad, and that a permit from this Board was all that was required to enable the contractor to open streets for work in the subways.

Later in the year the Borough President of Brooklyn undertook to interfere with the work of the contractor in that Borough, objecting to the occupation of certain cross streets in which material had been piled or machinery placed pending construction. As the Borough President threatened to remove those obstructions immediately, the contractor applied to the Supreme Court for an injunction to restrain such action, and called upon the Board, under the terms of the contract, to assist in securing the right to make use of the cross streets for the purpose of construction. The matter was argued before the Special Term of the Supreme Court in Brooklyn on October 2, 1906, but no decision had been rendered at the close of the year.

VENTILATION OF SUBWAY.

As stated in the report of the Board for 1905, the first advent of warm weather showed rather an unexpected condition of the atmosphere in the subway. The fact that it was extremely oppressive and that there was a distinct and unpleasant odor was a matter of no doubt whatever; but the cause of the conditions was uncertain and the means both of cure and prevention were still more so. The result of investigation showed that the air in the subway was practically as good as the air in the streets but had a considerably higher temperature, due chiefly to the amount of power which in one way or another was converted into heat in the course of operation. On February 1, 1906, Dr. George A. Soper, who had been employed as consulting sanitary engineer, made a very complete report on the whole subject, a copy of which accompanied the report of the Chief Engineer annexed hereto.

The Chief Engineer on March 22, 1906, presented his report as to practical methods for improved ventilation and refrigeration, and it was determined by the Board to adopt the plans thus submitted so far as they involved the construction of ventilating chambers. Certain schemes for refrigeration were also to be tried.

After a careful study of the details of construction of these ventilating chambers, a formal agreement was entered into with the Interborough Company for the construction of such outlets, the cost to be treated as extra work under the original contract, and this was at once put in hand. A large part of the construction was completed in the Summer with the result that the subway was noticeably cooler. The refrigerating experiments were also carried on with satisfactory results.

The details of all the efforts that have been made to improve the atmospheric conditions of the subway will be found in the annual report of the Chief Engineer.

Certain difficulties in the way of effective ventilation arose from the natural unwillingness of those in charge of the parks and parkways in the City to allow ventilating shafts to be constructed in them. Such objections have been made with respect to structures proposed to be erected in the parkways in Broadway near 140th street and in the Battery Park. By a little ingenuity, however, and incurring some additional expense, such structures can be made of moderate size and placed in position where they will prove not unsightly.

IV.

PROGRESS ON THE BROOKLYN-MANHATTAN RAILROAD, 1906.

The report of the Chief Engineer, hereto appended, sets forth fully the progress of the work of construction of this road:

The total amount expended for work done and materials furnished, under contract up to January 1, 1905, was	$1,314,387.21
The amount so expended for regular work during the year 1906, was	314,718.97
Making a total expenditure to date for regular work of	1,629,106.18
In addition there have been expended, for extra work under this contract	539,976.87
Making a total expenditure of	$2,169,083.05

For the details of these and all other expenditures of the Board, the reports of the Auditor and Chief Engineer should be consulted.

EARNINGS AND RENTAL.

The following table shows the gross receipts, operating expenses and net earnings of this line, from the time partial operation was begun early in January, 1905, to December 31, 1906, as furnished by the Interborough Company to the Comptroller:

STATEMENT OF EARNINGS.

January 16, 1905, to December 31, 1906.

	Gross Receipts.	Operating Expenses.	Profit.
From Jan. 16, 1905, to March 31, 1905.	$71,285.95	$2,954.48	$68,331.47
Three months ending June 30, 1905....	89,194.70	6,188.23	83,006.47
Three months ending Sept. 30, 1905....	109,488.10	30,214.00	79,274.10
Three months ending Dec. 31, 1905....	176,309.50	34,595.77	141,713.73
Total for 1905*.................	$446,278.25	$73,952.48	$372,325.77
January, 1906	$67,211.90	$11,466.72	$55,745.18
February, "	59,650.50	10,234.41	49,416.09
March, "	68,872.40	11,397.15	57,475.25
April, "	64,225.75	10,853.29	53,372.46
May, "	62,545.75	11,265.22	51,280.53
June, "	53,181.75	11,376.09	41,805.66
July, "	46,894.75	11,793.13	35,101.62
August, "	43,918.05	11,657.00	32,261.05
September, "	47,841.70	12,154.36	35,687.34
October, "	65,065.10	13,356.52	51,708.58
November, "	66,191.75	13,548.29	52,643.46
December, "	73,004.70	14,051.71	58,952.99
Total for 1906..................	$718,696.10	$143,153.89	$575,450.21

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*This line was opened for traffic to Fulton street on Jan. 16, 1905; to Wall street on June 12, 1905; and to the South Ferry on July 10, 1905.

The following statement shows the payments of rental by the Interborough Company to the City:

RENTAL PAYMENTS TO THE CITY JANUARY 16, 1905, TO DECEMBER 31, 1906.

Interest on bonds, Jan. 16, 1905, to Dec. 31, 1905	$9,783.48	
" " " March 31, 1906	4,598.17	
" " " June 30, 1906	4,598.17	
" " " Sept. 30, 1906	4,740.05	
		$23,719.87
Payment on account of Sinking Fund to July 31, 1906	......	5,255.29
Interest on bonds due Dec. 31, 1906	4,740.05	4,740.05
Total	......	$33,715.21

The total rental paid to the City on both the existing Rapid Transit Railways from October 27, 1904, to December 31, 1906, is $3,768,343.17, and for the calendar year 1906 the rent paid on these roads amounts to $1,901,746.72. With the completion of the Brooklyn-Manhattan line and the Van Cortlandt Park Extension, the annual rentals will amount to something over $2,000,000 a year.

DELAYS IN COMPLETION.

By the terms of the contract for the construction of the Brooklyn-Manhattan road, it should have been "completely constructed and equipped ready for immediate, full and continuous operation" by September 11, 1906. At that time the railroad from the Battery to Brooklyn, and through Brooklyn, was very far from completion, and the question arose as to whether under those circumstances The City was entitled to recover damages for the delay.

The contractor presented a variety of excuses, arising in part from litigation with property owners, in part from the unexpected physical conditions under the East river at both ends, and in part from the change in plan in Fulton street and Flatbush avenue as authorized by this Board and approved by the Board of Estimate and Apportionment.

The Rapid Transit Board was advised by counsel that so far as delays were due to controversies between the contractor or its sub-contractors and abutting property owners, or by physical difficulties which the contractor did not foresee, there was no sufficient excuse. The only ground upon which the contractor could claim an exemption from damages was the delay due to the change in plan above referred to. The proposed changes were adopted by the Board on April 13, 1905, were approved by the City authorities on May 9, 1905, and by the owners of a majority of the abutting property on October 12, 1905, so that there was a period of six months during which these proposed changes were under discussion. The Board were advised by their counsel that the general rule in such cases was that the contractor must be allowed for the time by which the final completion of the contract work was necessarily delayed by the alterations or omissions ordered by the owner; so that the time within which the road must be completed would be extended by whatever time might have been necessarily lost in consequence of the changes referred to.

The changes in plan have involved a great deal of additional work both in Fulton street and Flatbush avenue, and have necessitated a change in the orders for the steel used in construction, all of which has led to a very considerable delay. In consequence, the railway from the Borough Hall to the terminus at Atlantic and Flatbush avenues is still far from completion at the present time, and will be delayed after the rest of the road is ready for operation. It may, however, be said with truth that the contractor's work on this section of the railway has been pushed with most unusual rapidity, and there is no reason to believe there will be any unavoidable delay. The Interborough Company, under the contract, pays about four-fifths of the entire cost of the work, and can get no return until the road is in operation, so that it is very much to the contractor's interest to have the work completed at the earliest possible moment.

Numerous complaints were received during the year from owners or occupants of buildings along Fulton street and Flatbush avenue. These complaints were in substance that the streets were unnecessarily encumbered by the contractors so that traffic along the surface of the street became extremely difficult. The Board has used every effort to diminish the annoyance referred to, and has kept in constant communication with the representatives of the property owners and consulted them in regard to the methods to be employed. The work of building this part of the railroad involves not only supporting the elevated structure, but also of maintaining what is said to be the densest surface railroad traffic in the world. Moreover, the buildings on each side of the street are somewhat old, and have, as a rule, shallow foundations, which has involved very difficult underpinning and other work that must necessarily proceed slowly. It is believed that the principal sources of annoyance to property owners can now be removed and the street for the greater part be covered over and repaved.

EAST RIVER TUNNELS.

This work has undoubtedly lagged behind the rest of the contract to a great extent. Early in the year the contractor made a change in the organization of the working force, since which time the work has progressed better than before. One cause of delay, for which the contractor was not responsible, was the very difficult and unsatisfactory character of the material near the shore on each side of the river. Another cause of delay has been the sickness and death of Mr. Onderdonk, the original sub-contractor for this work.

A very serious cause of delay has been due to the necessity of reconstructing a part of the work in Joralemon street, and for a short distance under the East river. As early as the beginning of 1904 the Engineer of the Board had occasion to criticise the method employed by the sub-contractors in tunnelling under

Joralemon street, and money was withheld from time to time from the contractor on account of this defective work. In the end it was found that the tunnel had settled in some places so that a uniform grade was not obtained, and if this had not been corrected it would have been difficult to run trains through at a high speed.

The work of reconstruction of the parts of the tunnel thus affected will not delay the operation of the road, because all this work can be done before the tunnels under the East river are ready for the passage of trains.

On December 17, 1906, the hoods of the two shields of the north tube under the East river came together, so that communication could be established between the Boroughs of Manhattan and Brooklyn. It was found that the variation in grade amounted to less than 1/100 of a foot, and the alignment varied about 13/100 of a foot. By slight adjustments the two shields were made to meet exactly for line and grade. The Board regards this result as highly creditable to those who have been engaged in the work, particularly under the adverse conditions prevailing—all work having been done under compressed air at high pressure. It was the expectation at that time that the headings of the south tube would meet in February, and that both tunnels could be made ready for operation in the spring or early summer of 1907.

HOYT STREET STATION.

This important station in Fulton street, Brooklyn, has been the subject of a great deal of consideration, as stated in the report for 1905. Three agreements have been made with the owners of property on the corners of Bridge and Hoyt streets, by which the entrances to the station are built partly on their premises. An agreement has also been made with MESSRS. ABRAHAM & STRAUS by which an entrance will be made through their store.

As stated in the report for 1905, the Board has been urged to allow show windows to be placed opening upon the station platforms both at this station and also at the Nevins Street station, on Flatbush Avenue. The Board has not, however, made any arrangement of this kind with any of the owners of property, except where a station stairway was involved.

ENTRANCE TO WALL STREET STATION.

The same considerations which made it desirable to have entrances through private property at the Hoyt Street station have also operated to make it desirable to have such entrances at the Wall Street station. These have been so far secured, without cost to the City, by agreement with the owners. In addition to those now existing, agreements have been made for entrances through the new building at No. 1 Wall Street, and through the United States Realty building at the corner of Thames Street.

V.

LITIGATION.

Park Avenue Deviation.—The total amount of claims for damages in this matter as presented, amounted to $605,905. Some of those claims, amounting to $106,848.68, were withdrawn after a ruling from the referee adverse to the theory of the claims. The remaining claims were allowed by the referee at the figure of $199,630.18, or about one-third of the total amount originally claimed. The decision of the HON. ALTON B. PARKER, the referee, has since been confirmed by the Appellate Division, and a copy of it will be found in the appendix.

Wilcox v. McClellan.—This case, which was begun to determine the constitutionality of the act which took from the Board of Aldermen and conferred on the Board of Estimate and Apportionment the power of granting the consent of the City to the construction of street railroads, was finally decided by the Court of Appeals on April 24, 1906. The Court unanimously affirmed the decisions of the courts below sustaining this legislation. The opinion will be found in the appendix.

Incumbrances in Stations.—In the last report of the Board the subject of advertising and slot machines in stations was discussed, and it was stated that an action had been begun which it was expected would shortly be tried to require the Interborough Rapid Transit Company to remove such articles. The case was actually tried on January 8, 1906, at an equity term of the Supreme Court before MR. JUSTICE McCALL, whose decision was announced on December 24, 1906, sustaining the position taken by the Interborough Company. A copy of his opinion is printed in the appendix. The Board have directed counsel to take an appeal from the judgment to be entered thereon.

Sale of Electric Current by Contractor.—Early in the year the attention of the Board was called to the fact that the Interborough Company was proposing to make a connection between the feed wires of the subway and those of a street railway at 181st Street and Broadway, which they claimed they had a right to do without any permit from the Rapid Transit Board. They had secured a permit from the Commissioner of Water Supply, Gas and Electricity which it was asserted was sufficient. The ground of their contention was, in substance, that, as lessee of the railroad, the Interborough Company had the right to use any portion of the subway which was not required in the operation of the railroad for any purpose not inconsistent with railroad uses.

The Board was advised by its counsel that the legal question involved was in many respects similar to that raised in the case of the slot machines, to which reference has already been made; but that there were distinguishing features which would seem to make it proper to begin a separate suit. The Board therefore instructed counsel to begin an action in order to test the questions raised, which action was brought to trial on December 4, 1906, at an Equity Term of the Supreme Court, before MR. JUSTICE FITZGERALD, who reserved his decision in regard to the matter, and the case had not been determined at the close of the year.

Potter v. The Interborough Rapid Transit Co.—When the station at Wall street and Broadway was planned, it was the intention of the Board to have one of the entrances to that station pass through what is known as the Empire building, belonging to the devisees under the will of ORLANDO B. POTTER, deceased. The station was accordingly so constructed, having a short flight of stairs leading up to the basement level of the Empire building. This construction was made with the full knowledge of MR. FREDERICK B. POTTER, the managing trustee, and, so far as the Board was informed, with his approbation. Nevertheless, when the station was completed and about to be put in operation, MR. POTTER objected to the use of his property for an entrance except upon terms which were quite different from those made with other property owners similarly situated. After considerable discussion MR. POTTER caused the entrance to be bricked up at the foot of the stairs, and brought suit to restrain the Interborough Company and the Board from interfering with his wall. The case was tried on December 3d and 4th, 1906, before MR. JUSTICE FITZGERALD, who reserved his decision, and the case was not decided at the close of the year.

Rapid Transit Subway Construction Co. v. Coler.—In September, 1906, the President of the Borough of Brooklyn wrote, as mentioned in a former part of this report, to MESSRS. CRANFORD & MCNAMEE, sub-contractors engaged in work in that borough, directing them to remove an air compressor plant which had been put up in Furman street, close to its intersection with Joralemon street, under a permit from the Rapid Transit Board, and he threatened that unless immediately removed by the sub-contractors, it would be removed by the Commissioner of Public Works. He also notified the sub-contractors that they must apply to the Commissioner of Public Works for permits for the use of such streets or parts of streets as were not on the direct line of the tunnel.

This raised a simple question of law, namely, whether a contractor engaged in the construction of a rapid transit railroad under a contract with the City, made pursuant to the Rapid Transit Act, was entitled to use streets off of the immediate line of the route of the railroad under construction in which to pile material necessary for use, or to place machinery employed in such construction. In other words, whether permits issued by the Rapid Transit Board were sufficient, or whether the permit of the Commissioner of Highways or other city official was necessary in addition. The Rapid Transit Subway Construction Company and the sub-contractors began proceedings against the Borough President to enjoin him from interfering with their work, and called upon the Board, under the terms of the contract, to assist them in securing the right to carry on their work without molestation. Counsel for the Board accordingly appeared upon the argument of this case, which was had before MR. JUSTICE GARRETSON. A motion for an injunction was argued on October 2, 1906, but no decision had been announced by the learned judge at the end of the year.

Condemnation Proceedings.—The following proceedings are now pending to acquire lands or easements or have been referred to the Corporation Counsel with a request to begin such proceedings:

1. In the proceeding to acquire easements in lands at Fourth avenue, between Eighth and Ninth streets, in the Borough of Manhattan, the Commissioners have made their report, which will probably be confirmed by the court in February, 1907.

2. The proceeding to acquire sub-surface rights along the line of streets in Brooklyn is in substantially the same condition as at the close of the year 1905. An appeal has been taken by the Corporation Counsel in the test cases of MR. MYNDERSE, MR. NOTMAN and EX-JUDGE ABBOTT. Owing to the lamented deaths of MR. MYNDERSE and MR. NOTMAN within a short time of each other, there has been delay in bringing the appeal to a hearing. It is hoped that it may be heard by the Appellate Division in the spring of 1907.

The Commissioners are now proceeding to take proof of title as to the various other parcels for which claims have been presented on Joralemon street, Fulton street and Flatbush avenue; but have decided not to take any proof of value until the Appellate Division has rendered its decision on the appeal above mentioned.

3. In the proceeding to acquire sub-surface rights under the bulkhead, and water grants at the foot of Joralemon street, the late MR. JUSTICE GOODRICH and MESSRS. GATES and FAWCETT were appointed Commissioners, and had taken a large amount of testimony when JUDGE GOODRICH died. At the close of the year a new Commissioner had not been appointed in his place, and the proceeding was necessarily delayed pending the appointment of a successor.

4. As stated in the last report, a number of cases of damage to easements of light, air and access appurtenant to property on Westchester avenue and other streets in The Bronx have been settled. In the early part of the year 1906, some additional settlements were made; but as the possibility of further amicable adjustments seemed to have been exhausted, the Corporation Counsel began proceedings in which EX-JUDGE FREEDMAN and MESSRS. DUPIGNAC and GREENHUT were appointed Commissioners, their oaths being filed in the office of the Clerk of the County of New York on May 29, 1906. Under the Rapid Transit Act, the filing of these oaths vested in the City title to all the easements necessary for the construction, maintenance and operation of the elevated railroad in all property in front of which a rapid transit viaduct is built from 149th street and Third avenue to Bronx Park, at 181st street.

5. In the matter of easements north of Fort George, nothing has been done except to settle a number of cases, and such settlements are still progressing.

6. The proceedings to acquire a small triangle of land for a station at the intersection of Flatbush and Atlantic avenues, in the

Borough of Brooklyn, have advanced so far that the Commissioners have made their report, which will probably be presented for confirmation in February, 1907.

Respectfully submitted,

THE BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS,

By A. E. Orr,
President.

Bion L. Burrows,
Secretary.

APPENDICES TO REPORT

1906

RAPID TRANSIT COMMISSIONERS

AND

STAFF

RAPID TRANSIT COMMISSIONERS.

NAME	DATE OF ELECTION OR APPOINTMENT	REMARKS
Alexander E. Orr,	Appointed by Act of May 22, 1894	Resigned June 8, 1894.
	President N. Y. Chamber of Commerce, June 8. 1894.	Term of office expired May 5, 1899.
	Elected President of the Board, June 8, 1894.	
	Elected member of the Board, May 11, 1899.	
	Re-elected President May 23, 1899.	Now in office.
John H. Starin,	Appointed by Act of May 22, 1894.	
	Elected Vice-President, May 28, 1895.	Now in office.
William Steinway,	Appointed by Act of May 22, 1894.	Died November 30, 1896.
Seth Low,	Appointed by Act of May 22, 1894.	Resigned June 11, 1896.
	Mayor, Jan. 1, 1902.	Term of office expired Dec. 31, 1903.
John Claflin,	Appointed by Act of May 22, 1894.	
	Elected Treasurer May 28, 1895.	Resigned May 11, 1899.
	Re-elected Member of Board, Dec. 27, 1901.	Resigned April 19. 1906.

RAPID TRANSIT COMMISSIONERS—*Continued.*

NAME	DATE OF ELECTION OR APPOINTMENT	REMARKS
Thomas F. Gilroy,	Mayor, June 8, 1894.	Term of office expired Dec. 31, 1894.
Ashbel P. Fitch,	Comptroller, June 8, 1894.	Term of office expired Dec. 31, 1897.
John H. Inman,	Elected June 8, 1894.	Died Nov. 5, 1896.
William L. Strong,	Mayor, Jan. 1, 1895.	Term of office expired Dec. 31, 1897.
Woodbury Langdon,	Elected November 19, 1896.	Now in office.
George L. Rives	Elected November 19, 1896.	Resigned Dec. 27, 1901.
Charles Stewart Smith,	Elected Dec. 10, 1896.	Now in office.
Robert A. Van Wyck,	Mayor, Jan. 1, 1898.	Term of office expired Dec. 31, 1901.
Bird S. Coler,	Comptroller, Jan. 1, 1898.	Term of office expired Dec. 31, 1901.
Morris K. Jesup,	President N. Y. Chamber of Commerce, May 5, 1899.	Now in office.
Edward M. Grout,	Comptroller, Jan. 1, 1902.	Term of office expired Dec. 31, 1905.
George B. McClellan,	Mayor, Jan. 1, 1904.	Now in office.
Herman A. Metz,	Comptroller, Jan. 1, 1906.	Now in office.
Lewis Cass Ledyard,	Appointed by the Mayor May 15, 1906.	Resigned Dec. 22, 1906.

STAFF OF THE COMMISSION.

NAME	DATE OF ELECTION OR APPOINTMENT	REMARKS
Wm. Barclay Parsons,	Chief Engineer, June 18, 1894.	Resigned Jan. 1, 1905.
George S. Rice,	Chief Engineer, June 1, 1905.	
Henry R. Beekman,	Counsel, June 18, 1894.	Resigned Jan. 1, 1895.
Albert B. Boardman,	Counsel, June 18, 1894.	
Parsons, Shepard & Ogden,	Counsel, Jan. 1, 1895.	Firm dissolved Jan. 1, 1902.
Tracy, Boardman & Platt (now O'Brien, Boardman, Platt & Dunning),	Counsel, Jan. 1, 1895.	
Edward M. Shepard,	Counsel, Jan. 1, 1902.	Succeeding Parsons, Shepard & Ogden. Resigned Mar. 1, 1904
George L. Rives,	Counsel, March 1, 1904.	
Lewis L. Delafield,	Secretary June 18, 1894.	Resigned June 1, 1899.
Bion L. Burrows,	Secretary June 1. 1899.	
H. A. D. Hollman,	Auditor, May 10, 1900.	
James Dolan,	Messenger, June 28, 1894.	

APPENDIX II.

OPINIONS OF THE COURTS

COURT OF APPEALS.

CLERMONT H. WILCOX, Appellant,
v.
GEORGE B. McCLELLAN, as Mayor, and others, Respondents.

APPEAL from a judgment of the Appellate Division of the Supreme Court in the first judicial department, entered January 17, 1906, which affirmed a judgment of Special Term sustaining a demurrer to the complaint.

The nature of the action and the facts, so far as material, are stated in the opinion.

L. LAFLIN KELLOGG and ALFRED C. PETTÈ for appellant.

THEODORE CONNOLY and WILLIAM P. BURR for respondent.

EDWARD M. SHEPARD, PAUL D. CRAVATH, WILLIAM D. GUTHRIE and CHASE MELLEN for the Union Railway Company of New York, intervening.

GEORGE L. RIVES and ALBERT B. BOARDMAN for the Board of Rapid Transit Commissioners for the City of New York, intervening.

O'BRIEN, *J.*—This action was brought by a taxpayer of The City of New York against the Mayor and the other officials of that City constituting the Board of Estimate and Apportionment. The purpose of the action was to restrain the Board from proceeding to exercise the various powers conferred by the statutes hereinafter referred to. The defendants demurred to the complaint on the ground that it did not state facts sufficient to constitute a cause of action. The demurrer was sustained by the trial court, and the judgment was subsequently affirmed on appeal.

The plaintiff's case is based entirely upon allegations that the statutes conferring new powers upon the defendants as the Board of Estimate and Apportionment are void as in conflict with the State Constitution. This general conclusion is based upon various grounds and reasons that need not be referred to with much detail, since the whole argument rests upon one or two propositions that are controlling. The enactments attacked by the complaint were passed, or at least became laws, on the 27th of May, 1905, and consist in form of three separate statutes. Two of them are amendments to the charter with respect to the powers and duties of the Board of Estimate and Apportionment and the Board of Aldermen. (L. 1905, ch. 629; L. 1905, ch. 630.) The other is an act which purports to amend chapter 4 of the Laws of 1901, known as the Rapid Transit Act. (L. 1905, ch. 631.) The general scope of the complaint is to the effect that the Legislature had no power to pass these laws, since it was an attempt to abolish or greatly restrict the powers and duties of the Board of Aldermen as the legislative and governing body of the City, and transfer these powers and duties to another Board, namely, the Board of Estimate and Apportionment.

It is argued that prior to the passage of these acts the power to grant franchises rested with the Board of Aldermen, while by the legislation in question the power of the Aldermen over this subject was abolished and transferred to the Board of Estimate and Apportionment. This changing of the statute in various ways constitutes the substantial element in the complaint, and it is necessary only to deal with that feature of the controversy.

All franchises or privileges known by that term proceed from the State in the exercise of its sovereign powers. Through different mediums or agencies the State may act in granting franchises, but it is itself the source and depositary from which the right proceeds. Sometimes the franchise is conferred directly by the State through some grant or legislative enactment, but more generally the sovereign delegates its power to municipal or local authorities. It is in the manner of delegating the power to certain officers of The City of New York that it is claimed that the constitutional power of the Legislature has been transcended in this case. There can be no doubt that the Legislature had the power to repeal the charter in so far as it conferred power upon the Board of Aldermen to grant franchises. The authority that conferred the power could abolish it or take it away. It makes no difference that this power was exercised by the Legislature before the official terms for which the Aldermen were elected had expired, since that body had no vested right to the continuance of any of the public powers or duties conferred upon them by the charter. Having abolished or greatly limited the powers of the Aldermen with respect to the granting of franchises, the Legislature was not compelled to leave this power in abeyance, but might confer it upon any other local authority authorized by the Constitution. There is no constitutional restriction upon the power of the Legislature to delegate to local authorities the power to grant franchises for the use of the public streets or otherwise, except in one class of cases. The Legislature is forbidden by the Constitution to pass any local bill granting to any corporation, association or individual the right to lay down railroad tracks; and, further, that no law shall authorize the construction or operation of a street railroad except upon condition that the owners of one-half in value of the property bounded on, and the consent, also, of the local authorities having control of, that portion of the street or highway upon which it is proposed to construct or operate such railway shall be first obtained. (Constitution, art. 3, sec. 18.) Therefore, the Legislature has no power, direct or indirect, to grant a franchise for the purpose of laying down railroad tracks in the street, except upon the conditions specified in this provision of the Constitution, and one of these conditions is that the consent of the local authorities having control of the street shall be obtained. As to all other franchises, the Legislature is not restricted in conferring power upon the local authorities.

It is contended by the learned counsel for the plaintiff that at the time of the passage of the acts in question the Board of Aldermen constituted the sole authority having control of the streets within the meaning of this provision of the Constitution. If this were so we cannot see how it would restrict the Legislature from abolishing that power and transferring it to some other Board or department of the City Government. But it seems to us that the contention cannot be sustained as a matter of fact. When the various charters and statutes relating to the control of the streets of the City are examined it will be found that for certain purposes the Board of Aldermen possess certain powers. The Board of Estimate and Apportionment possess the power to open and close streets and alter the City map, and the Street Commissioner or Commissioner of Public Works possessed certain other powers in that respect. It was, therefore, competent for the Legislature, by the acts in question, to specify the particular body or Board that should be deemed to have control of the streets within the meaning of the Constitution, and in this case it has designated for that purpose the Board of Estimate and Apportionment. There is nothing in the Constitution to prevent the Legislature from making such a designation, or from changing it from time to time as the public interest may require, and that is substantially what the legislation in question seeks to accomplish. The burden is upon the plaintiff to point out the particular provision of the Constitution claimed to have been violated in the passage of these laws. The amendments were an exercise by the Legislature of its undoubted power with respect to the government of cities, and every presumption should be indulged in favor of the validity of its action. If, in the judgment of the Legislature, the Board of Estimate and Apportionment was the proper body to intrust with the granting of franchises, we are unable to see wherein any right of the Board of Aldermen or of any other officer or individual has been unduly invaded.

The argument in support of this appeal has taken a wide range and much has been said with reference to the manner in which the Board of Estimate and Apportionment is constituted and the methods by which consent is given to the granting of franchises. It is contended, in substance, that the legislature had no power to give control of the streets to such a body since by its constitution a mere minority of the individuals composing it may determine the question before it. In this view of the case it may be well to restate the functions of that board and the purpose for which they were conferred by the charter. The amendments in question did not create the Board of Estimate and Apportionment, nor regulate the manner in which its assent shall be expressed as to questions that come before it. All these things are to be found, not in the amendments, but in the charter as it previously existed and are really not attacked by the complaint at all. The charter of the city of New York, as we all know, was the result of the labor of a commission composed of its most eminent citizens. It numbered amongst its members professional men of the highest character, business men and persons who had long been familiar with the city government. That commission reported to the legislature, and it may be useful here to recall what was said in that report with reference to the Board of Estimate and Apportionment, and the manner in which its decisions were to be made. We quote from the report, which the legislature incorporated into the new charter:

"The Commission has recommended a considerable extension of the powers now conferred upon the Board of Estimate and Apportionment. With respect to what may be called the routine expenditures of the City, whether they are provided for by taxation or by use of the City's credit, the Board of Estimate and Apportionment is given large powers. By reason of the possession of these new powers and of the increase of its freedom in exercising the powers which it has from the beginning of its history possessed, the Board of Estimate and Apportionment under our draft charter will be the most important body in the City government. Whatever dissatisfaction may have been felt with any other municipal body the Board of Estimate and Apportionment has generally given satisfaction for its capacity, efficiency and integrity. Under the plan of the Commission it will be in reality the centre of all legislative activity in relation to financial affairs and of much of the administrative activity of the City. It will be in effect an Upper House of the City Legislature and also a cabinet of the most important administrative officers. In dealing with the composition of the Board of Estimate and Apportionment the Commission has not been unmindful of the danger of changing an agency of government which has long and successfully stood the test of experience. The present Board consists of the Mayor, the Comptroller, the President of the Council, the President of the Department of Taxes and Assessments and the Corporation Counsel—the two last-named officials being appointees of the Mayor. In giving to the Mayor the absolute power of removal it is evident that his appointees would be to a greater extent than at present under his influence, so that the Mayor in the Board of Estimate and Apportionment might, in effect, have three votes out of the five. It is not considered advisable to make the Corporation Counsel and the President of the Department of Taxes and Assessments elective officers; neither was it considered desirable to elect additional members to the Board at large. A board consisting of three members would be manifestly too small. On the other hand the fact that the Board of Estimate and Apportionment was given the power to disapprove the decision of Local Improvement Boards and to determine the amount of money to be expended out of the treasury of the City in public works in each borough made it proper that the boroughs should have a direct representation on the Board. The Commission has, therefore, recommended that the Board of Estimate and Apportionment shall be composed purely of elective officers, viz.: The Mayor, the Comptroller and the President of the Board of Aldermen, elected by the City at large, and of the Presidents of the five Boroughs, elected by the citizens of their localities. But in adding the Borough Presidents to the Board of Estimate and Apportionment another question required consideration. If the Borough Presidents were to possess a voting power, not only equal to that of each other but also to that of the other members of the Board, they might together control its decisions, and this would mean that the financial control of the City would pass from the officials who are not directly interested in spending the City's money to officers at the head of great administrative agencies and charged with the duty of spending large sums in the development and improvement of the particular localities they are elected to represent. It, therefore, seemed essential that the total voting power of the five Borough Presidents should be less than that of the officers elected from the City at large, and it was not throught just to give to the representatives of the smaller Boroughs an equal vote with the Presidents of the two great Boroughs of Manhattan and Brooklyn. What should be the representation of the different elements in the Board of Estimate and Apportionment has been one of the most difficult questions which the Commission has had to answer. We propose to give three votes to each of the officers elected at large, two votes each to the Presidents of the Boroughs of Manhattan and Brooklyn, and one vote each to the Presidents of The Bronx, Queens and Richmond. It will be perceived that the total number of votes in the Board will be sixteen, and that nine of these votes will be cast by the officers elected at large, assuring to them a control of the Board." (Assembly Documents No. 40.)

In organizing the government of the city of New York as it now exists the legislature had the power to provide for cumulative voting in the Board of Estimate and Apportionment. The charter unites not only two great cities, but counties, towns and villages under one general system of municipal government. Some of the municipalities thus united were large, populous and wealthy. Again, many of them were mere rural towns, and two whole counties and the larger part of a third county were embraced in the consolidation. In the decisions of questions involving vast interests that devolved upon the board it would be obviously unjust and unfair to permit each member to vote *per capita,* and accordingly it was enacted that they should have votes in proportion to the interests they represented. There is nothing new in such a principle when applied to a system of popular government where localities and not individuals are a controlling element. The duty of electing the president of the United States may in certain cases devolve upon the House of Representatives, and then it is provided that the individual member is eliminated and the vote taken by states, each state, whether great or small, having but one vote. There is nothing in the Constitution of this state to prevent the legislature from providing for cumulative voting in such boards. It is a question of policy, not power.

There is nothing in the case of *Rathbone* v. *Wirth* (150 N. Y. 459) that has any bearing on the questions in this case. The statute in that case provided for the election by the common council of the city of Albany of a police board consisting of four persons. The board were local city officers required by the Constitution to be elected by the people or appointed by such local authorities as the legislature should direct. The local authority selected by the legislature and named in the statute to make the appointment was the common council, and so far the form of the Constitution was complied with. But in substance it was violated, since the statute was so drawn as to enable a political minority of the whole body to elect a police board There was no provision in the statute for cumulative voting in the common council, and the question discussed in the case at bar was not involved at all. But there was a provision in the statute "that no person is eligible to the office of police commissioner unless at the time of his election he is a member of the political party or organization having the highest or next highest representation in the common council." What this court held was that a minority of the common council was not the local authority contemplated by the Constitution and the statute to make the appointment. In other words, it was not the common council, and that the legislature had no power to so frame a statute on political lines as to produce such a result, since while it professed to obey the Constitution, it was an evasion of its letter and spirit.

If in that case the charter of the city of Albany or any existing law provided, for instance. that the mayor should on such questions be authorized to cast two votes instead of one, then a question somewhat similar to that in the case at bar might possibly arise, but there was nothing of that kind in the statute or in any law, and the members of the common council were authorized to vote only *per capita.* It is a very common provision in city charters that the mayor, although a member of the common council, shall not be entitled to vote on any question before the body unless there is a tie. The same power that could deprive him of a vote as a member of the common council could also authorize him to cast one vote or two, as the legislature might deem just and proper. It is one thing to make decisions in a municipal board by cumulative voting. It is quite another thing to so manipulate a statute that a minority may overrule the will of the majority, and elect officers that the common council only had the power to elect.

In the case at bar the so-called home rule provision of the Constitution has no application. The statutes in question did not assume to appoint any one to a local or other office. At most, the statutes simply imposed some new and additional duties upon the Board of Estimate and Apportionment which had theretofore been performed by the aldermen. There is nothing in the Constitution that forbids such legislation.

The judgment should be affirmed, with costs.

CULLEN, Ch. J., HAIGHT, VANN, WERNER, WILLARD BARTLETT and HISCOCK, JJ., concur.

Judgment affirmed.

(*Decided, April* 24, 1906. *Reported,* 185 *N. Y.,* 9.)

SUPREME COURT.

APPELLATE DIVISION—FIRST DEPARTMENT.

IN THE MATTER

of

The Application of the BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS FOR THE CITY OF NEW YORK for the Confirmation of the Report of the Commissioners Upon the Proposed THIRD AVENUE ROUTE and Other Routes.

MOTIONS to confirm reports of commissioners under the Rapid Transit Act (Laws of 1891, chap. 4, as amd.).

GEORGE L. RIVES and ALBERT B. BOARDMAN, for the motion.

MARTIN W. LITTLETON and WILLIAM BYRD, for certain property owners, opposed.

O'BRIEN, P. J.:—The Rapid Transit Commission, under the law, has laid out the general plan of subway routes which have received the approval of the Board of Estimate and Apportionment, but for which the consent of the property owners along the proposed routes could not be obtained.

It is provided by law that upon the refusal by property owners to consent, application may be made to this court for the appointment of commissioners whose duty it shall be to pass upon and determine whether or not such consent should be given, and their report when favorable, if confirmed by this court, is equivalent to the consent of those owning property along the lines of the proposed route.

In all, nineteen applications relating to nineteen different routes were made, and commissioners were appointed, and we have now before us some nine routes in which the commissioners have made favorable reports, and we are asked to confirm them. The function, duty and powers of the court in these proceedings have been the subject of judicial construction, and we deem it unnecessary to add to the views expressed by this court in *Matter of Rapid Transit R. R. Comrs.* (5 App. Div. 290); *Matter of Rapid Transit Comrs.* (23 id. 472) and *Sun Publishing Assn.* v. *Mayor* (8 id. 230). These sufficiently indicate that our function is not merely perfunctory or formal, but that a grave responsibility rests upon the court in passing its judgment upon what is the most stupendous scheme of municipal improvement and expenditure ever undertaken, and without a parallel in its ultimate bearing upon the destiny of the people of what we have reason for thinking will be the greatest city of the world.

It is agreed on all hands that transit facilities should be furnished as speedily as possible, and that the extent of the facilities to be furnished should in some degree be proportionate to the rapid growth of our population throughout the greater city. Upon the question of the present necessity for all of the routes proposed, we find no grounds for differing from the conclusions reached by the rapid transit commissioners; and were there no other questions involved our duty would be simple and plain.

There is, however, involved another and very serious feature, and it relates to the financial ability of the city to undertake the proposed construction. It is shown by the record before us in the Third avenue case that the nineteen routes of subway will cost $300,000,000 for construction, and $150,000,000 for equipment, or a total of $450,000,000. Under the restriction imposed by section 10 of article 8 of the Constitution, as amended (Laws of

1903, vol. 2, p. 1456; Leg. Manual, 1906, p. 197), the total borrowing margin of the city, most favorably viewed, did not exceed on January 1, 1906, $61,000,000. If we can look at the future, there is a likelihood, in view of the increased values of property, that the city will have a debt-incurring capacity between the 1st of July, 1906, and the 1st of January, 1907, of something like $110,000,000. And if all of it were appropriated for rapid transit construction, there would be nothing left for the other departments of the city government, which in expense and importance are increasing and expanding from year to year.

No doubt, in the future, with the growth of values, the assessments on property can be considerably increased, and thus the borrowing capacity of the city can be enlarged; but a policy which would seek to unduly add to the burdens of the taxpayer, or which would seek artificially to create values, would be more fatal, in our judgment, to the true and right development of our city than the failure to provide transit facilities.

The vote of the people in 1894 that subways should be constructed with public funds, and the recent legislation limiting the terms of the lease which it is in the power of the Commissioners to make, render it problematical as to what extent private capital will be attracted to undertake the construction of future subways, if permissible by law, upon which question, because not before us, we express no opinion.

In the subway built, the City advanced for construction more, as the event proved, than was absolutely necessary for construction proper, and this excess was available to the contractors, who were bound and from their own funds agreed to advance the money needed for the equipment and operation of the road. The feature, however, that was undoubtedly most attractive to bidders was the lease obtained for a period of fifty years. Under the Elsberg Bill, the lease of subways is limited to twenty years; and although there is a provision that the City can lease it for a further term of twenty years, it is upon condition that the City can agree upon the terms of the second lease, which leaves it practically optional with the City, and gives the first lessee no assurance of more than a single term of twenty years. How far this may affect the intervention of private parties in the enterprise, we need not at present inquire, because as the law now stands the Commissioners must look to the City for the funds needed to undertake the construction of these subways.

We are thus brought back to a consideration of the most serious question as to the financial ability of the City and its bearing upon the approval which is sought from the Court. Upon the record before us, it appears beyond the possibility of doubt that the City has not the financial ability at the present time to undertake the building of all of the routes proposed, and the only effect of our approval will be practically to completely appropriate and tie up every thoroughfare leading into and through Manhattan Borough.

There is force, therefore, in the contention made by the counsel for the taxpayer who opposes the confirmation that "if the Court at this time approves and confirms the proposed routes, it concludes and estops for all time to come its opportunity, nay, its duty, to protect, oversee and supervise the complex interests of the people inhabiting this greater city, as well as posterity. That the court should weigh the ultimate effect of the action prayed for can well be appreciated when we realize the powerful and unlimited opportunities the Rapid Transit Commission have for foreclosing the rights, privileges, needs, demands and necessities, co-ordinate, to say the least, in every phase and from every standpoint, of all the various governmental agencies and requirements of this municipality. It is well known that at this time a percentage of the children of this city are denied proper schooling by reason of the limited facilities. What may be said of the limitations that may be entailed upon future generations if by the supposed necessities of rapid transit the credit of the city should be so impaired as to make it impossible for proper provision to be made for schools, and the other varied municipal needs, such as proper policing, fire service, paving, etc.? Again, by the adoption of the proposed plan, and the practical monopolizing of all the city's streets, wedded to a single scheme or idea of transit construction or management, the people are practically forever concluded from asserting and exercising a right which has much of reason and argument in its support, to wit, to own and operate their own municipal subways. It may be that in a year or a few years the vast majority of the people of this greater city, in their enlightened judgment, will demand the construction and operation of their own transportation facilities."

"If the Court approves the applications now pending, the territory may be so despoiled as to absolutely destroy all possibility for future construction that would in any way become approximately competitive to the interests now in command of the city's transit facilities. The present plans distinctly disclaim any purpose or desire to definitely fix any one of the proposed routes as final, but seek to commit this Court and to estop it for all time from interference, no matter what the intervening interests may be, so that there may be no opportunity for this Court to protect the people in the evolution of their municipal development." "If it be argued that the Rapid Transit Commission will not undertake to construct all of the proposed routes simultaneously, then it may safely be said that this Court should not release its power to guide and direct the subway construction so that the City may have the benefit of competitive lines."

To these might be added another suggestion which is important to property owners, who, if any of the routes were to be immediately built, would, as an offset against the consequential damages that would result during the period of construction, finally have the benefit of the road when constructed. But to have their property affected by the approval of a route which might never be built, acting as it would as a notice to all that the street was appropriated for railroad purposes, would impede the development and improvement of property along its line, which would be an injury with no resulting good. It is frankly conceded by counsel for the Rapid Transit Commissioners that there is no purpose immediately to build all the proposed routes, but that it is necessary that they should all be approved, to the end that the City may be enabled to undertake such as it can find means to build. This necessarily involves the further concession that the Rapid Transit Commissioners have not finally determined upon the routes to be selected, but they wish the whole subject to be in such shape that as the opportunity presents itself they may take advantage of it. This would appropriate all the streets involved in the proposed routes for an indefinite period; and in view of the ever changing conditions in transit facilities and the probable further progress and development of engineering skill and ingenuity, it is not an improbability to assume the likelihood that a city which has seen in a few years a change from horse cars to cable and then to electric motive power, and to which has been added elevated railroads, and, lastly, subway transportation, may have in store a system of transit which may be as great an advance as elevated roads and subways are over surface horse railways. This is but expressing the view that if we are now to appropriate all our streets irrevocably under the present plans it is possible that when the City has the financial ability to construct in accordance with those plans they may then be antiquated and no longer desirable. While the chance, or even the prospect, of future improved methods would not, standing alone, be a reason for withholding approval of routes actually determined to be constructed immediately, it is entitled to consideration before approving of plans irrevocably to be adhered to for routes which, owing to the financial resources of the City, cannot all be initiated or carried out for many years to come.

We have not overlooked the fact that the City's limit of debt incurring capacity is constantly changing. Nor are we unmindful that, unless the growth of the City is to be seriously retarded, new rapid transit facilities must be furnished in the near future. But while it is evident that these facilities must be furnished by the construction of subways and tunnels, the City has other demands upon its treasury of a very pressing nature, including the construction of new schoolhouses and docks, and the opening of new parks, bridges, etc., which will necessarily prevent the exhaustion of its entire borrowing capacity in rapid transit construction. Probably no prudent City administration would deem it wise, in the present condition of its financial affairs, to commit it in the near future to an expenditure for rapid transit exceeding $50,000,000. It, therefore, follows that if construction is to be begun upon all of the routes which have been approved by the local authorities, about eight-ninths of the cost must be provided by private capital.

Much difference of opinion exists about the effect of the recent amendment to the Rapid Transit Act upon the probability of enlisting private capital in new rapid transit construction, but it is plain that the Rapid Transit Commission cannot offer as attractive terms to bidders under the new law as it was able to offer under the old law. A lease for twenty years, with a possible renewal for twenty more upon terms to be fixed at the expiration of the first period, must be far less attractive to bidders than a lease for fifty years, with a renewal of twenty-five years upon terms made in advance, making the term offered to bidders practically a seventy-five-year term. Whether private capital can be obtained to any considerable extent under the present law is a question which time only can solve. But it is plainly the duty of the Court, under the circumstances, to consider the possibility that an attempt to do so will result in failure. Therefore, it becomes the duty of the Court to consider, in the interest of the abutting property owners who are represented in this proceeding, as well as in the general interest of the City, whether all the routes presented to the Court for approval should be approved, irrespective of the possibility of commencing construction thereon in the near future. If it were possible for the Court to determine in advance which routes have the right of way, or, in other words, which routes are the most urgently needed and are most likely to attract private capital, the Court might approve of these routes and reject the rest, without prejudice to another application under changed conditions. The difficulty is that there is nothing before us to show a greater need for one route than another, or a greater probability of construction on one route than on another. During recent years the usefulness and value of vaults and other sub-surface structures in streets have greatly increased. In most cases, these privileges are held at the pleasure of the City authorities, and the abutting owners must be content to vacate where the City needs the space occupied by them for other and more important uses. But it is one thing to ask them to vacate to make way for a road which is building, and it is another thing to permit an important street to be preempted for a road which may not be built during the life of the present generation.

Regard being had, therefore, to these different and conflicting interests, we think the right solution, so far as it rests with this Court, will be to approve all of the routes conditionally upon the Rapid Transit Commissioners deciding within two years which of them they have finally concluded to construct. This will enable them, within the period named, in view of the then existing condition of the City's finances, to determine just what routes should be built; and after that time they should be required, if able to construct other routes, to renew their application to this Court. This will render null and void our approval of all routes not selected and contracted for within said two years.

The suggestion made by a taxpayer in the Third avenue proceeding, that the Court should not confirm the report of the Commissioners unless the Board of Rapid Transit Commissioners file a stipulation to incorporate in the contract for the construction of the proposed subway a clause making the contractor and his sureties liable for all damages to the walls, foundations or other parts of adjacent buildings or structures, is answered by the fact that the insertion of such a condition at the present time would be premature, and is unnecessary for the protection of property owners. It will be noticed by reference to chapter 607 of the Laws of 1905, section 37, that the Rapid Transit Act is amended so that a public hearing is to be had as to the terms and conditions of the contract, at which citizens shall be entitled to appear and be heard, and by other provisions in that section no contract can be made until the Board of Estimate and Apportionment shall have consented thereto. So that, even if the Rapid Transit Board should insert provisions for the protection of property owners which they may deem unsatisfactory, they will have a further opportunity to be heard before the Board of Estimate and Apportionment. As the act, therefore, seemingly leaves this question as to the terms and conditions of the contract with the proper city authorities, the Court should not undertake, in advance of the time when it becomes necessary to make the contract, to impose conditions which might or might not be embarrassing.

There are other objections that have been presented and arguments urged against our approval of the reports; but for the reasons stated, we think that the reports should be confirmed, subject to the condition and limitation suggested.

McLAUGHLIN, LAUGHLIN, CLARKE and HOUGHTON, JJ., concurred.

(*Decided, July* 12, 1906. *Reported,* 114 *App. Div.,* 379.)

APPELLATE DIVISION OF THE SUPREME COURT.

FIRST DEPARTMENT.

IN THE MATTER

of

THE BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS: MODIFICATION OF PARK AVENUE SECTION.

REFEREE'S REPORT.

I, ALTON B. PARKER, referee appointed herein by order of this Court, dated January 13, 1904, "to take testimony and report with such testimony to this Court his opinion as to the amount of the damages, if any, which at any time prior to the hearing before said referee have been respectively sustained by such owners of real property abutting on the easterly side of Park avenue between Thirty-fourth street and Forty-first street, in the Borough of Manhattan, in the City of New York, as shall present their claims for such damages in the manner and within the time hereinafter prescribed by reason of the construction of the easterly tunnel section of said railway," DO REPORT:

I.—That upon receiving the order of the Court making such appointment, I took and subscribed the oath as referee, which is hereto annexed.

II.—I caused to be published a notice for the presentation of claims as by the order of reference I was directed to do, which notice bears date September 18, 1905. A copy of such notice is hereto annexed.

III.—Thereafter, and within the time prescribed by the notice, thirteen (13) different claims were presented, the aggregate of the amount demanded in such claims being $605,905. The following is a summary of each of the several claims:

1. Frederick W. Devoe, No. 59:

For actual construction and expense for safety..	$36,540.83
For architect's and engineer's fees............	2,250.00
For storage and incidentals..................	1,250.00
For loss of rental or occupancy..............	15,000.00
For legal expense..........................	5,500.00
	$60,540.83

2. Arabella D. Huntington, No. 65:

For estimated cost of repairs.................	$6,380.00
For loss of rental or occupancy..............	20,111.01
For fee damage............................	25,000.00
For legal expense..........................	5,000.00
	$56,491.01

3. Charles T. Barney, No. 67:

For actual construction and expense for safety..	$11,709.45
For estimated cost of repairs.................	100,567.50
For architect's and engineer's fees............	4,350.12
For loss of rental or occupancy..............	50,000.00
For fee damage............................	50,000.00
For legal expense..........................	23,129.79
	$239,756.86

4. George H. Byrd, No. 69:

For actual construction and expense for safety..	$1,297.79
For loss of rental or occupancy...............	5,000.00
For fee damage............................	10,000.00
For legal expense..........................	953.00
	$17,250.79

5. ALICE T. WHEELOCK, No. 75:

For actual construction and expense for safety..	$2,238.68
For loss of rental or occupancy...............	10,000.00
For fee damage...........................	10,000.00
For legal expense..........................	500.00
	$22,738.68

6. ALICE T. WHEELOCK and MARY A. KEMEYS, No. 77:

For actual construction and expense for safety..	$1,111.50
For fee damage...........................	10,000.00
For legal expense..........................	500.00
	$11,611.50

7. EMILY A. LAWRENCE, No 81:

Damages to building.......................	$2,250.23
	$2,250.23

8. ANNA M. FRASER, No. 87:

Damages to building.......................	$392.13
	$392.13

9. MAUDE A. B. BANKS, No. 89:

Damages to building, furniture, carpets, bric-a-brac	$2,824.73
Board and lodging while house was unfit for occupancy	683.00
	$3,507.73

10. MARY P. HOGAN, No. 93:

For all damages, including damages to building, fee damage, cost of repairs and legal expense	$31,009.07
	$31,009.07

11. EDWIN PARSONS and others, Executors, Nos. 97 and 99:

Fee damage due to loss of lateral support and continued vibration	$50,000.00
	$50,000.00

12. Benjamin Welles and others, Executors, No. 101:

For damages to building by explosion.......	$4,450.00
For loss of rental or occupancy.............	36,216.65
For fee damage..........................	50,000.00
	$90,666.65

13. Manhattan Eye, Ear and Throat Hospital, No. 103:

For actual construction and expenses for safety	$9,689.52
For fee damage..........................	10,000.00
	$19,689.52

IV.—The first hearing took place at my office on the 14th of November, 1905, when the following appearances were entered:

Edward M. Shepard, Esq.,
Attorney for Board of Rapid Transit
Commissioners.

Messrs. Harrison & Byrd,
Attorneys for George H. Byrd, Esq.

Messrs. Masten & Nichols,
Attorneys for Charles T. Barney, Esq.,
and George G. Wheelock, Esq.

Messrs. Reid, Esselstyn & Ketcham,
Attorneys for Claimant Hogan.

Messrs. Lord, Day & Lord,
Attorneys for Manhattan
Eye and Ear Hospital.

Messrs. Spencer, Ordway & Wierum,
Attorneys for Emily A. Lawrence,
Maude A. Banks and Anna M. Frazer.

John M. Bowers, Esq.,
Attorney for Benjamin Welles and
J. M. Taylor as Executors and Trustees under the Last Will and Testament of Benjamin S. Welles, deceased; Benjamin Welles, individually, and Frances Welles, his wife; Jennie A. Girard,

J. W. Girard and Mary Girard, his wife; Sumner Girard and Julia M. Girard.

(Property represented here takes up half a block on the northeast corner of Fortieth street and Park avenue, and is known as No. 101 Park avenue.)

Messrs. Hornblower, Byrne, Miller & Potter,
Attorneys for Charles A. Boston, as
Executor and Trustee under the Last Will and Testament of Charles Boston; and for Sarah J. Parsons.

(This property is known as 97-99 Park avenue.)

Charles G. Bennett, Esq.,
Attorney for Arabella D. Huntington.

G. Holmes Crawford, Esq.,
Attorney for F. W. Devoe.

The scope of the order became at once the subject of discussion, it being insisted upon by certain claimants that injuries which resulted to property on the east side from dynamite stored on the surface of the street but on the west side thereof was within the order.

After listening to the arguments of counsel and examining the briefs submitted, I reported orally at the following hearing that in my judgment damages resulting from explosion under such circumstances were not within the order. At the same time counsel were advised that a ruling would then be made, excluding such evidence, in order to permit counsel, if they regarded themselves as aggrieved by the construction placed upon the order, to apply to the Court for an amendment thereof or for further instructions to the referee, the object being to save the parties and counsel the unnecessary expense and burden of attempting to prove claims which it seemed must inevitably be excluded. The result of the ruling was that the claims presenting that question were withdrawn.

V.—Six (6) claims, in all, were formally withdrawn, the claimants preferring to rely upon their actions at law, such claims being those of Emily A. Lawrence, owner No. 81 Park avenue; Anna M. Fraser, owner No. 87; Maud A. B. Banks, owner No. 89; Mary P. Hogan, owner No. 93; Edwin Parsons and others, executors, owners Nos. 97 and 99, and Manhattan Eye, Ear and Throat Hospital, owner of No. 103.

VI.—That of the seven claims remaining, four of them, namely, the Devoe, Huntington, Barney and Welles claims were amended. As amended, they are as follows:

DEVOE, upon No. 59:

For safety	$3,820.83
For actual construction (including architect's and engineer's fees and estimated cost of further necessary repairs)	33,109.80
For loss of occupancy and cost of storage	10,875.00
For legal expense	5,500.00
Making in all	$53,305.63

HUNTINGTON, upon No. 65:

For estimated cost of repairs (including engineer's fee)	$14,290.00
For loss of occupancy	20,111.01
For legal expense	5,000.00
For fee damage	25,000.00
Making in all	$64,401.01

WELLES, and others, Executors, upon No. 101:

For estimated cost of repairs	$4,450.00
For loss of rentals	38,241.66
For fee damage	50,000.00
Making in all	$92,691.66

CHARLES T. BARNEY, upon No. 67:

SCHEDULE A.

(*a*) *Shoring.*

Bill of Canavan Bros.	$8,234.66
Interest, cost and disbursements in suit of Canavan vs. Barney	536.59

(*b*) *Foundations.*

Payments already made to Foundation Co.	2,994.21
Estimate of Foundation Co. for going to bed rock	48,256.00

(*c*) *Exterior work above grade.*

Estimate of Tide Water Building Co.

1. Rebuilding walls, &c.	28,000.00
2. Main entrance portico and stoop, columns, stone and iron railings, &c.	14,520.00
3. Increased cost of labor and materials	3,700.00

(*d*) *Plumbing and steam heating.*

Estimate of Wells & Newton Co.:

1. Plumbing	2,800.00
2. Steam heating	2,500.00
3. Additional work for cutting out and incidental repairs	1,200.00

(*e*) *Interior Repairs and Decoration.*

Estimate of Stanford White	15,000.00

(*f*) *Miscellaneous.*

Anderson H. Tyson, services	2,643.76
Watson G. Clark, borings	174.25
Jennings & Welstead, carpentry	159.50
Charles Sooysmith, services	200.00
McKim, Mead & White, disbursements	103.02
	$131,021.99

(*g*) *Architects' Commissions.*

Ten per cent. upon above bills as allowed..........	$13,102.00

(*h*) *General.*

Depreciation of real estate......................	60,000.00
Interference with health, comfort and peaceable enjoyment	50,000.00
Legal expenses and disbursements.................	5,025.96
Total	$259,149.95

VII.—I DO FURTHER REPORT that I have been attended from time to time by counsel who appeared for the several claimants. I have listened to the oral testimony, made examination of the exhibits, heard the arguments of counsel, and now, after having examined the briefs submitted by them, do report to the Court the testimony taken, together with my opinion as to the amount of damages which has been respectively sustained by such claimants prior to the hearing before me.

Every one of these properties was in some measure injured by the change of location of the northbound tunnel. And as I construe the order of reference, aided by the opinion which preceded it, it is the purpose of the Court to save harmless these several owners who have suffered specially by reason of this unauthorized change of route, but that it does not intend to include such possible damage as might result to the property by reason of the operation of a railroad therein—a conclusion which is helped by the fact that the Court in settling the order struck out from the phrase "by reason of the construction and operation of the easterly tunnel section" the words "and operation," and by the further fact that the order expressly confines the damages to those sustained "at any time prior to the hearing before said referee."

It should be said in this connection that while some evidence has been adduced tending to show that the property on the east side of the avenue between Thirty-fourth and Forty-first streets is of less value than at the time of the sinking of the soil of Park avenue—due to the construction of the easterly tunnel section—the evidence upon that subject in its entirety persuades me that it is not so; that the fact is that property on both sides of the avenue at this point has instead appreciated in value. I do not mean by that statement that at all times there could have been a ready sale for the property in question at its market value prior to the injury. There was no demand for it at all while the shoring was up and the outcome uncertain. But all that had passed away before this hearing, and the property which had been restored to its former condition, the expense of which is now to be borne by the city, was in demand and at a greater price than in March, 1902.

The various heads under which the evidence of the claimants may be grouped that tends to measure their damages are:

1. Cost of Assuring Safety.

It is claimed on the one side, and conceded on the other, that any reasonable expense incurred for expert advice and the like to assure safety of the buildings by reason of the sinking of the soil of Park avenue should be allowed to the claimant.

2. The Actual Cost of Repairing Injury to Buildings.

It is conceded that the reasonable cost of actual repairs made necessary by the construction of the tunnel should be allowed to the several claimants as part of the damages. The counsel for the Rapid Transit Board does not, however, make that concession as to structures like stoops not resting on the claimants' land, but affixed to the street belonging to the city. That exception applies to but three of the claims and will be referred to later.

3. Cost of Proposed and Necessary Repairs of such Injuries.

There are two claims in which the repairs have not yet been made. It seems very clear that notwithstanding the fact that three years and a half have passed away since the buildings were injured, the claimant is entitled to have awarded to him under this order the reasonable cost of making the repairs. The evidence consisting of estimates as to the probable cost of making repairs is not so satisfactory as where the repairs have actually been made and the claimant is able to make proof that the repairs were not only needed but that the cost was reasonable. It must be weighed, however, in the light of the facts and circumstances to which reference is made in the briefs of counsel and a decision arrived at as to the amount required to make good to the claimants the damages actually sustained.

4. REPAIRS OF STRUCTURES IN STREETS.

This sub-head is referred to in the exception under sub-head 2.

One of the claimants, Mr. Barney, makes a substantial claim for damage to his stoop, which was projected into the street. His claim for damages to that structure exceeds $14,000, and the evidence is conclusive that it would cost very near, if not all of, that sum to put it in the condition in which it was at the time of the sinking of the soil which resulted in injuring two very expensive pillars.

The theory of the counsel for the Rapid Transit Board is that such structures were maintained under a mere revocable license given by the city, and that at any time the city could require for street purposes the use of the land thus occupied. Hence it should not be required to pay for the replacement of stoops placed on its own land through its consent. The damages which the parties sustained by having their stoops injured or destroyed should, it would seem in all good conscience, be made good to them as well as their other damages. And it is within the power of the Court to provide for their payment, though it were true—were the question presented in some other proceeding—there might be legal difficulty in the way, but there seems to be no serious legal difficulty.

The several steps which logically lead to the right of the recovery of these claims seem well grounded.

(*a*) "It is competent for the legislature to authorize a limited use of sidewalks in front of buildings in cities and villages for stoops or cellar openings or under-ground vaults for the more convenient and beneficial enjoyment of the adjacent premises."

Jorgenson v. *Squires,* 144 N. Y., p. 284.

The principle is asserted in later cases.

Dougherty v. *Horseheads,* 159 N. Y., 154.

Robert v. *Powell,* 168 N. Y., 411.

(*b*) It has been decided by this Court in *Broadbelt* v. *Loew,* 15 App. Div., 343, subsequently affirmed without opinion, 162 N. Y., 642, that

> "the fair inference from the statutes of the States and the decisions of the courts is that it is within the power of the Common Council to pass appropriate ordinances regulating the subject of the fronts of buildings facing on public streets and to grant permission to owners of buildings to occupy a certain space for certain purposes beyond the building line, if these constructions do not in reality interfere with the free use of those parts of the public streets to be kept clear of obstructions as public highways."

The Court considered many of the ordinances and statutes, which led it to express the conclusion quoted, and it is only necessary in this connection to make such reference to them as will show that the claimants in question are within its provisions.

(*c*) Sections 8 and 9 of the Revised Ordinances of the City of New York for the year 1859 were reproduced as Sections 36 and

37 of Chapter 6, Article 4, of the Ordinances in 1880. After the creation of Greater New York the ordinances were again revised, and those ordinances now appear as Sections 182 and 183, and without any material change. Section 8 prohibited the construction of any platform, stoop or step in any street of a greater width than seven (7) feet, while Section 9 provided that nothing contained in the preceding sections of this chapter shall be deemed to prohibit the continuation of any approaches, doors, stoops, platforms or steps which were heretofore erected, unless the same shall be complained of to the Street Commissioner and he shall have directed their removal or alteration within a reasonable time. Apparently, the purpose of this provision was to permit the owner to enjoy the use of stoops, platforms or steps extending into the street for even a greater distance than the previous section permitted until such time as the Street Commissioner should conclude that the public interests required its alteration or removal.

(*d*) The stoops of the claimants in this case do not project into the street seven feet beyond the building line and are therefore within the limitation prescribed by the ordinance.

(*e*) Specific authorization for their construction is not required under the ordinances to which reference has been made, but if required then it must be held that the authority to construct was originally granted by the city. These stoops were constructed many years ago—in the Barney case probably forty years ago. In such a case, and especially where the construction is within the limits prescribed by ordinance for such construction, the presumption of law is that the municipal authorities authorized the construction. It was so held in *Jennings* v. *Van Schaick,* 108 N. Y., 530. At page 533 the Court said:

> "We have assumed that from long use and acquiescence (18 years) the consent of the municipal authorities to the construction of the coal-vault and its aperture should be inferred, and so the structure was not, in and of itself, a nuisance."

It is clear, therefore, that it was within the power of the Legislature to authorize the municipality to consent to this construction and that the municipal authorities did so with the understanding that it was to become a permanent part of the house.

The City cannot revoke that license without reasonable notice, for such is the language of the ordinance. That notice was never given, and until given the owner possessed the right of enjoyment and the City could not wantonly or by an act of trespass destroy this property while the license continued unrevoked. I, therefore, recommend that the claimants be compensated for the damages to their stoops as well as for the injuries to the other portions of their houses.

5. Loss of Rental or Either Total or Diminished Occupancy Value.

It was determined by the Court in this case that the Rapid Transit Board created a nuisance by which these claimants suffered. The opinion expresses it to be the view of the Court that the owners should be compensated for all the damages that had been caused by such illegal and unauthorized construction. These claimants, so far as their demands for rental value and loss of occupancy are concerned, are divided into three classes:

First—Where the premises which were to rent had failed to get tenants because of the nuisance.

It is conceded that in such case the claimant may recover such damages as his proof will show he has lost.

Second—Where in the judgment of the owner prudence required him to move out of the house in which he was living.

It is conceded that in that case there may be recovery for the loss of his occupancy. The measure of that loss adopted for the purposes of this proceeding was the rental value of the property at the time.

Third—Where, notwithstanding the nuisance and the great annoyance, the owner continued to occupy the premises, but demands the damages sustained by reason of the diminished rental or occupancy value.

The rights of such claimants to recover anything because of diminished occupancy values is challenged. No authority is cited in support of the challenge. On the other hand, this Court passed upon the question in *Rosenheimer* v. *Standard Gas Light Company*, 36 App. Div., 1, 10. There the plaintiff sought to recover, among other things, the damages sustained by property occupied by her. The nuisance being established, the trial Court instructed the jury that the plaintiff was entitled to recover for the diminution in the rental value of her property, and this Court said:

> "The damages to property temporary in their nature and continuing while the nuisance lasts can only be measured by the diminution in rental value or the difference between the rental value free from the effects of the nuisance and subject to it. The same rule applies whether the property is in the possession of a tenant or in the occupation of the owner." (Citing *Francis* v. *Schoelkopf*, 53 N. Y., 152; *Tallman* v. *M. E. R. R. Co.*, 121 N. Y., 119; *Lawrence* v. *M. E. R. Co.*, 126 N. Y., 483; *Woolsey* v. *N. Y. E. R. R. Co.*, 134 N. Y., 328.)

Some other judicial writers have, in actions brought by the owner and occupant to recover damages sustained by reason of temporary acts constituting a nuisance, employed the phrase "diminished usable value" in lieu of "loss in rental value."

Bates v. *Holbrook*, 89 App. Div., 548-555.

Whether they use one term or the other, the result is an award of damages to the owner and occupant, measured in the same way. Following these authorities, I have made allowance to three of the claimants for the diminished usable value of their occupancy.

It is impossible to read the testimony in this matter without reaching the conclusion that the parties who continued to occupy their premises would have found the rental value very seriously reduced had they made an effort to rent their properties. Take the Byrd house for an illustration, No. 69 Park avenue. In the spring of 1901 blasting was heard, and it continued to increase in strength as the work approached the house from both directions, and it continued during the winter of 1901 and 1902. After a time the work came so near the house that the drilling could be heard, and it continued not only all day, but all night. At times this noise was almost unbearable to the occupants of the premises, and as the blasting drew near to the house from each direction the shock was severe and necessarily alarming to the inmates. Still they continued on in occupation. It was their home. After a time the house began to settle. Then it was necessary to shore up the front of the house. This was some time in January, 1903, and those unsightly timbers remained in that position until some time late in the fall of 1904, but unsightly as they were, they added to the comfort of the family because of the support they gave to the front of the wall. However, at the time of the shoring the family deserted the front part of the house, moving to the back part. They continued to occupy the back part for several months thereafter, and then only one front room was occupied for a much longer period. Thus it is seen that the claimant did not enjoy the full use of the building, and that he stayed in rather than enjoyed such part of it as he did attempt to occupy. He did not have, therefore, the full usable value of his property, and he should be compensated for that portion of which he was deprived. The measurement of his compensation is not easy, but as close an approximation thereto as possible should be made.

6. CLAIMS OF OWNERS FOR PERSONAL SUFFERING.

No allowance, of course, is made to the wives and children and servants of the owners for sufferings occasioned by blasting and for the noises and shocks incident to the work. The claims with which I am directed to deal by the order are the claims of abutting owners and for damage sustained to the property of which they are the owners. Where a family promptly moved out there was no great annoyance; and the rental value of the property compensates, approximately, the owner. Where he concluded to brave the situation with his family and subject them to the annoyances incident to blasting, etc., his only compensation for the annoyance to which his family was subjected comes in the way of his recovery in this proceeding for such a proportion of the full usable value of his property as he lost by reason of the nuisance.

7. LEGAL EXPENSES.

Evidence was tendered in behalf of some of the claimants with the object in view of showing the expense incurred in certain litigations, having for their purpose in part a judgment enjoining the Rapid Transit Board from building the northbound tunnel in the way it was finally constructed. This evidence was not received because it seemed to me very clear that moneys expended in fruitless litigation could not possibly have been intended to be within the four corners of the order furnishing the limit of authority in this matter. Counsel for the several claimants did submit, in pursuance of a ruling, their several claims for the value of their services in this proceeding. I advised counsel in making the ruling that it did not seem to me that compensation to claimants for their disbursements including the services of counsel in the conduct of this proceeding was within the order, but that their statements would be received, as it might happen that the Court would conclude that an allowance ought to be made to reasonably cover the services of counsel and disbursements, and thus might be saved a further inquiry. I report to the Court that it seems to me entirely feasible for it to treat this proceeding—so far as it relates to each claimant—as an independent special proceeding. And as there is a recovery by each, the Court could direct that each successful claimant should have his taxable costs and disbursements and an extra allowance based upon the amount of his recovery in this proceeding, and I recommend that that be done.

1. FREDERICK W. DEVOE CLAIM, No. 59 Park avenue:

Counsel for the Rapid Transit Board objects to an allowance of the item of $650, the actual cost of repairing the stoop, on the ground that the stoop was on the street, hence the City should not pay for any damage to it. For the reasons presented earlier in this report that objection is overruled and the item allowed. He also objects to the item of $1,250 paid for storing claimant's furniture and household goods during the time that he was unable to occupy his house. Instead of hiring another house, he went to a hotel to live and was obliged to store his household goods. The expense was made necessary by the injury to his house and his forced removal therefrom.

The argument is made that his claim for rent of the house is being allowed, and that he should not in addition have the expense of storage; but the answer is that the removal and storage of the furniture was made necessary by the repairs that had to be made to the house, and the rental which Mr. Devoe is allowed is concededly but a fair rental for the house unfurnished. Counsel's objection to recovery for fee damage is sustained, as is also his objection to an allowance of claimant for $5,500 for his legal expenses in the conduct of this proceeding; the latter item is disallowed on the ground that I do not regard it within the scope of the order.

I report that the claimant should be allowed the rental value of his house from March 21, 1902, to July 7, 1904, at $4,200 per year	$9,625.00
and, further, that he has either expended or will be obliged to expend in the completion of the repairs and for the purposes herein the following sums:	
1. Cost of shoring and needling the building under orders from the Building Department after survey and order of the Supreme Court as required by law	$3,212.30
Interest on said amount from October 30, 1902, the date of payment, to October 21, 1905	578.00

2. Survey fee to architect duly appointed to act on survey of 59 Park avenue according to law	25.25
Interest on above amount from May 9, 1902, to October 21, 1905	5.28
3. Damage to the front wall of building	5,500.00
4. Damage to front stoop, gate, cellar and basement window guards and anchors for front	200.00
5. Damage to heating apparatus	770.00
6. Damage to plumbing work and gas pipes in house	880.00
7. Damage to plaster	1,925.00
8. Damage to electric installation	162.80
9. Damage to gas fixtures	22.00
10. Damage to window frames, sashes, inside wooden trim, shutters and blinds	2,000.00
11. Damage to floors in house	500.00
12. Damage to front and vestibule doors	400.00
13. Damage to roof, cornices, etc	500.00
14. Damage to sidewalk; the stones of which were heavy blue stone slabs, which were broken in pieces, so as to be useless	500.00
15. Damage to the foundation of the front and side walls and the front portion of the lot, which made it necessary to construct a new foundation starting from a level more than 50 feet below the surface and meanwhile to shore up and needle the rest of the building at a cost of	17,500.00
16. Services of A. L. Webster, Civil Engineer	500.00
17. Cost of storing furniture, silverware and other valuable articles	1,250.00
18. Services of architect	1,750.00
Making in all	$47,805.63

which sum should be awarded to him.

2. ARABELLA D. HUNTINGTON, Claim upon No. 65:

Mrs. Huntington has made no repairs whatever, but has left her premises in the condition in which they were after the land slip, without tenants, or without effort to put them in condition for tenants. The property was, however, damaged to some extent, the front porch being very seriously injured so as to require a substantial sum to put it in condition. Mrs. Huntington has produced witnesses who have given estimates as to the cost of repairs and of restoring the building to its former condition. The Rapid Transit Board has also produced witnesses who have given estimates of the cost. I report that the cost of restoring the

building, including the porch, will be the sum of....	$10,774.00
to which should be added........................	100.00
already paid for an investigation at the time of the slip, and	400.00
in addition for architects' fees, expense of superintendence, in all, $500. I also find that there should be allowed to Mrs. Huntington for injury to rental value	5,835.00
Making in all	$17,109.00

At the time of the land slip Mrs. Ann Crawford was the tenant of Mrs. Huntington at an annual rental of $7,000, and she had paid that rent in advance to April 1st, 1902. Before that date, and on March 21st, she and her boarders were ordered out of the premises on the ground that the earth slip had rendered them dangerous. She did not surrender her lease, however, and subsequently went back to the possession of the premises, but she was not able to make a success of it, and thereafter, and on September 10, 1903, she was dispossessed. Until after this latter date, therefore, Mrs. Huntington, the owner, is not entitled to an award for damage to rental value. But while she is not entitled to recover for the damages she indirectly sustained while the lease was in force, she should be allowed for the diminution in rental value from the time she came into possession on down to March 21, 1904, when the blockade of the street was raised, and also on down to July, 1904. It took Mr. Devoe until July of that year to make the repairs to his premises, and it seems to have been regarded as a reasonable time on all sides. The damage to Mrs. Huntington's rental value for that period I find to be $5,835. Mrs. Huntington makes claim for injury to rental value, after July, 1904, but I do not see how it can be allowed in view of the fact that the house was not tenantable, as appears by the testimony of claimant's witnesses, and it could easily have been made tenantable within the period for which allowance has been made to her at the full rental value of the property prior to the land slip. The Rapid Transit Board and the City must pay for the cost of putting the house in repair, and for the loss in rental value for the reasonable period required to make the repairs. I have recommended an allowance for rental damage, ten months, at the full rental of $7,000 per year, a period which seems to have been quite long enough for the making of the comparatively small amount of repairs that were required to make good the injury done to the house by the land slip. Had the house been thus put in repair, the rental value would, after July, 1904, have been as great as before, but it was not then, nor since, repaired, and until it is the house will remain tenantless.

3. CHARLES T. BARNEY CLAIM, LOT NO. 67:

It is claimed at the outset by counsel for the Rapid Transit Board that the damages sustained by Mr. Barney may not be made good to him because of the fact that he was a director of the Rapid Transit Subway Construction Company, which made the construction complained of. The theory of the learned counsel for the Rapid Transit Board is that it is the duty of directors to direct; that Mr. Barney must be presumed to have done his duty, and hence that he contributed toward that direction which resulted in the creation of the nuisance of which he complains. A very interesting question would be presented, it seems to me, were it established as a fact that Mr. Barney by his vote and action contributed directly toward such a construction as was made.

But it is not established as a fact, and I am quite confident that there is no authority in the courts to indulge in the presumptions required to treat it as a fact. Boards of Directors do not always act as one man; they are frequently divided, and with the knowledge of that general fact the Court should hesitate before indulging in a presumption to the contrary that would visit a director with such serious loss. It is, however, established in this case by Mr. Barney's testimony that he did not know of this change of route on Park avenue; indeed, he testifies in effect that prior to beginning some very expensive work on his house in the spring of 1901, he endeavored to ascertain the exact route of the tunnel and its probable effect upon his house. With that purpose in mind he wrote John B. McDonald a letter and received from him a reply enclosing a diagram showing the proposed route in front of Mr. Barney's house. It showed the tunnel to be thirty (30) feet distant from the building line. Thereafter, he proceeded to decorate and otherwise improve his house, and was not made aware until after the cave-in on the block below in March, 1902, that the plans originally shown him had not been adhered to. Mr. Barney's house was at the time of the land slip very artistically decorated, the improvements begun nearly a year before having been finished but a comparatively short time. The effect of the land slip was to seriously threaten the house. Measures promptly and vigorously undertaken, however, resulted in saving the building, although there were serious cracks in its walls. Mr. Barney expended in shoring up the building and in placing steel beams under the foundation walls the sum of...... $11,765.46 and it is conceded here that this sum of money should be made good to him. He has not repaired the building. With the exception of the moneys expended in shoring up and securing the foundations no money whatever has been laid out. But he produced on the hearing experts in the various kinds of construction, who presented estimates of the cost of restoration of the building to its former condition. These estimates of future cost added to the sums already referred to as having been expended would make the total cost of restoration something over $144,000. Mr. Stanford White, a witness called by Mr. Barney, testified that the building as it stood could be rebuilt for $140,000, less the decoration. These figures invite attention to the differing points of view of counsel. On the one side, the position practically is,—we are entitled to have a new house if only for the purpose of getting rid of cracks without patching. On the other side it is that all the Rapid Transit Board and the City need do is to furnish money enough to patch up the cracks and take out the brick on each side of the broken wall and relay it so as to make the bond perfect, and then cover the patched work on the inside walls with decoration looking as near like the other as possible. Between these two extremes the line of compensation should be drawn. It would seem to be absurd to build an entirely new side wall in a house forty years old for the purpose of getting rid of a crack which could be rendered safe by the relaying of bricks one or two feet in width along its entire length. The estimated cost of getting rid of the danger of a crack by that method should not, however, be the sole award, for full and complete justice is not meted out to the party whose wall is restored by the method I have suggested. Such a wall is not as attractive as before the injury. While as safe as before it does not look so well, and that constitutes an item of importance in a valuable house such as Mr. Barney's. Therefore, there should be awarded to him not merely the cost of patching up the wall, but something in compensation for that defect which is apparent even after repairs, and therefore takes away from value. The aim should be to make good his loss as near as may be.

The first estimate that I shall consider is that of the Foundation Company for going to bed rock as a foundation for the house, the estimate of cost being $48,256. I have recommended that there be allowed Mr. Devoe the cost of going to bed rock for a foundation. It was the judgment of experts in foundation work at the time he did it that it would be necessary to go to bed rock for the foundation, and it was done and paid for by him. Hence it seemed proper that he should be reimbursed for an expenditure incurred by him at a time when he had no reasonable assurance of reimbursement. But Mr. Barney did not proceed to construct his foundation down to bed rock as did Mr. Devoe, but has waited, and, according to the testimony of the experts produced by the Rapid Transit Board, time has shown that it is unnecessary to go to bed rock in order to get an adequate support for the building. This testimony is now based on the fact that the earth has been demonstrated to be sufficiently strong to uphold the building, and I am fully persuaded that that is so. Indeed, I do not understand it to be contradicted at all by Mr. Sooysmith, who is the foundation expert, produced on behalf of Mr. Barney. He testified that at the time of the land slip he advised going down to bed rock for the foundation wall, and his expression of opinion was limited to the time of the investigation which he made for the purpose of giving advice. This question was put to him by Mr. Barney's counsel, "whether in your opinion this house could be properly rebuilt without putting the foundation down to an extent necessary to reach the solid rock," and his reply was: "I would hardly wish to give testimony on the bases other than those known at the time I made my examination and report, and at that time I considered it was advisable to go to the depth proposed." The Rapid Transit Board produced responsible engineers, who described how the foundation wall could be made perfectly safe and strong by the

construction of masonry of the kind described, and gave it as their estimate that the work could be done for $9,670.00
and Mr. Starrett offered to take the contract for the work and assume all the responsibility. There is no evidence disputing the cost of construction according to the method recommended by the latter, and I report that such sum should be awarded for the purpose of completing the foundation.

The Tidewater Building Company estimated that it would cost $28,000 to take down and rebuild the northerly and westerly exterior walls up to the third story. It is not pretended that it is necessary to rebuild the walls for safety. The Rapid Transit Board produced competent people who said it would cost $2,080 for repairing the cracks in the walls to get rid of which is the main purpose of this $28,000. I have concluded that midway between these two extremes will be found the figure that will properly repair the wall and compensate the owner, and I report in favor of an award of.......................... 15,000.00
for that purpose.

The same company estimated that the cost of repairing the entrance portico and stoop would be.... 14,520.00
I report in favor of an allowance of that sum. The objection that the City should not pay for damages to a stoop I have considered in an earlier part of this report.

They should be allowed for the repair of the plumbing and steam heating, and repairs incidental thereto. $5,000.00

Stanford White estimated that the cost of re-decoration incidental to the repairs that would have to be made would be the sum of..................... 15,000.00
and I find that such a sum should be awarded for that purpose.

There should also be awarded to Mr. Barney for moneys paid or to be paid to Anderson H. Tyson, for services	2,643.76
to Watson G. Clark, for borings	159.50
to Jennings & Welstead, for carpentry	174.25
to Charles Sooysmith, for services	200.00
to McKim, Mead & White, for disbursements	103.02
	$74,235.99
and there should be added ten per cent (10%) for architects' commissions upon the foregoing allowances, amounting to	7,423.59
making in all for repairs	$81,659.58

The effect of the land slip on the usable value of Mr. Barney's property was to very substantially diminish it. The effect was more serious during the months that the blasting and drilling were continuing, and while there was a feeling of doubt and uncertainty as to the effect that it was to have upon the building. Even after that its usable value was diminished because of the patent and irritating defects in the side walls and decorated ceilings of this house upon which a very large amount of money had been expended in the year 1901. As the repairs have not yet been made, the usable value is still diminished, but I think that Mr. Barney should not be awarded compensation for it subsequent to the expiration of a reasonable period within which he could have made the repairs. Mr. Devoe overhauled his building, reconstructed the front, went down to bed rock for his foundation walls, and completed the entire work in July, 1904. It appears, therefore, in this case that the time used by him in making repairs furnished a reasonable period within which to do the work. Beyond that period Mr. Barney should not be allowed

compensation for diminished usable value. Between the dates I have named covering the period of two years and four months, I find that the usable value of his premises was diminished at the rate of $5,000 per year, and that he should be awarded............	11,666 00
making a total award to Mr. Barney of............	$93,325.58

4. George H. Byrd, 69 Park avenue:

Mr. Byrd paid out in restoring walls, foundations, ceilings, etc., and in other expenses...............	$1,500.79
It is conceded by counsel that that amount is reasonable and should be allowed. I find that there should be allowed to Mr. Byrd for diminished rental value by reason of the nuisance, the sum of......	5,000.00
making in all	$6,500.79

5. Alice T. Wheelock, 77 Park avenue:

Mrs. Wheelock is allowed her claims amounting to	$611.50

She makes no other claim except for legal expenses and for fee damage.

6. Wheelock and Kemeys, 75 Park avenue:

The claimants have paid out for repairs to their premises caused by the land slip the sum of........	$1,823.68
The claimants were in the occupation of their premises during the period which is the subject of this general controversy, and were subjected to a very considerable degree of annoyance on account of the nuisance, and I find that the diminished usable value of these premises for that period was the sum of....	5,000.00
the total award recommended being, therefore......	$6,823.68

7. WELLES AND OTHERS, EXECUTORS, No. 101 Park avenue:

The claim in this case is for depreciation in rental value caused not, as in the cases we have considered, by the land slip, but by the construction and use in front of claimants' premises, some twenty odd feet north of the northerly line of Fortieth street and in the roadway, of an office shed and other buildings. Immediately to the north of this office another shed some fifty feet in length was erected, separated by partitions from south to north. The southerly compartment was used as a carpenter shop, the northerly one for storing lanterns, tools and different kinds of materials; the next for sharpening tools and fixing materials and tools used in the construction of the tunnel. The noise of the anvils, which were in use from seven in the morning till five in the afternoon, was such that the windows in the claimants' apartment house had to be kept constantly closed. Soft coal was used in the machine shop, and black smoke and cinders poured from the smokestack. The northerly apartment was used as a sand shed and afterwards for the storage of cement, concrete, however, being mixed in the open street. These sheds were so placed as to leave only eight feet seven inches of free roadway in front of the claimants' premises. This made the approach of carriages to the entrance of the apartment house impracticable. In March, 1901, the contractor sunk the shaft used for the construction of the northerly half of the easterly tunnel section ten feet north of the sheds already described and five feet from the easterly curb line of Park avenue. Over this shaft the contractor erected scaffolding about nine feet above the level of the street. A derrick was placed just north of the shaft and a hoisting engine to control the derrick on the scaffolding. This hoisting engine was used night and day and added considerably to the noise and discomfort caused by the contractor's operations. The necessary result of all this was to make the apartment house undesirable. The evidence shows that the obstructions placed immediately in front of the claimants' premises, that is, in the easterly roadway of Park avenue, between Fortieth and Forty-first streets, were placed there on account of the construction of the easterly tunnel section. The shaft sunk in the easterly roadway was used only for the construction of the easterly tunnel section. The derrick on the easterly roadway was used solely in connection with this shaft. The hoisting engine placed upon the scaffold was used solely for the operation of this derrick. The flags and paving stones lying on the easterly roadway had been removed to allow the sinking of the easterly shaft. The office and sheds were used in connection with both tunnel sections, but the construction and operation which so seriously injured the claimants were used in connection with and incident to the construction of the easterly tunnel section alone, and it was necessary, as it appears that they should have been located where they were in view of the location of the easterly tunnel section, but it was not necessary for the office and sheds which were also used in connection with the westerly tunnel to be located in that place, for they could have been located elsewhere with equal convenience in the prosecution of the construction of the westerly tunnel section. Therefore, it is urged by counsel, and it seems to me justifiably so, that this shaft and hoisting engine and derrick and other apparatus that obstructed the highway and became very offensive to the tenants were due to the fact of the change of location at this point of the easterly tunnel section, and hence that that which was done under the directions of the Rapid Transit Board at this point on the surface of the ground constituted a nuisance just as much as the actual construction of the tunnel under the surface. If this position be well taken, and I am of the opinion that it is, the claimants are within the protection of the order and entitled to recover their damages.

I find that the rents actually lost by the claimants during the construction of the easterly tunnel section and by reason of it was the sum of $20,490. The usual rental value of the apartments affected was the sum of $22,766.66, but from evidence adduced on the hearing I am convinced that there should be a deduction of ten per cent. (10%) as an allowance for those necessary periods in apartment houses when for a time upon the moving out of one set of tenants a vacancy for a time ensues. Every one of the apartments are now rented, but tenants were not obtained for all of them immediately after the work upon the easterly tunnel section was at an end. It would seem to be natural that when a house has once been deserted for any reason by any considerable number of tenants that it would not promptly fill up again, and that has been the experience of the owners of these premises.

Between the time when the easterly tunnel section was completed and the time when the apartment house was once more all rented there was a loss in the usual rentals charged to tenants of $15,475. A part of this should be borne by the Rapid Transit Board, and the City, as I think it is the indirect result of the nuisance which came near making the apartment house tenantless. After deducting ten per cent. (10%) for the reason given above, I conclude that it would be but just that the City should pay one-half of the loss in rents for the period referred to, amounting to $6,964, making the total amount that I recommend to be awarded to the claimants in the event that the Court agrees with the conclusion that I have reached that the damages sustained by these claimants are within the scope of the order, $27,454.

All of which is respectfully submitted.

ALTON B. PARKER,
Referee.

Dated, October 31, 1906.

SUPREME COURT.

SPECIAL TERM.

THE CITY OF NEW YORK,
v.
INTERBOROUGH RAPID TRANSIT COMPANY.

MR. GEORGE L. RIVES and MR. ALBERT B. BOARDMAN, for the plaintiff.

MR. DELANCEY NICOLL and MR. PRATT A. BROWN for the defendant.

McCALL, J.—This action was instituted by the Board of Rapid Transit Railroad Commissioners in the name of The City of New York, for the purpose of restraining and preventing the maintenance of weighing and vending machines in the stations of the railroad owned by the plaintiff and operated by defendant within the City of New York, which railroad is popularly called the "subway."

The Board of Rapid Transit Commissioners is a body duly organized and acting pursuant to the powers conferred upon it by chapter 4 of the Laws of 1891, and the acts amendatory thereof, commonly known as the "Rapid Transit Act." That act was passed by the Legislature of this State to comply with the demand of the People of the City of New York for speedy, safe and reliable transportation, and it authorized the said board to lay out routes for railroads and procure them to be built and operated, if not by private enterprise, then the City itself was empowered to build the railroads and lease them for a term of from thirty-five to fifty years upon payment of a rental not less than the interest upon the cost of construction and one per cent. additional. The railroads, if constructed by the City, were to remain its absolute property and to be deemed a part of its system of public streets and highways, to be used and enjoyed by the public upon the payment of such fares and tolls and subject to such reasonable rules and regulations as might be provided and imposed by the said Rapid Transit Board (*Sun Pub. Ass'n* v. *Mayor, etc.,* 152 N. Y., 257).

Pursuant to the Rapid Transit Act a contract was entered into about the 21st day of February, 1900, with John B. McDonald for the construction of an underground railroad according to the plans and specifications submitted by the said Board of Rapid Transit Railroad Commissioners, which railroad is now in operation, although the road as now operated was not all included in the contract hereinabove referred to. The contract provided that Mr. McDonald should equip the railroad and lease same from the City on the terms referred to above and operate it carefully and skillfully according to the highest known standards of railroad operation. On July 10, 1902, Mr. McDonald assigned his contract, so far as it related to the equipment, lease and operation of the subway, to the defendant company, which has operated the road since its completion about November 1, 1904.

The road as operated maintains stations in which it has permitted to be placed automatic weighing machines by which passengers may ascertain their weight by standing upon a small platform and dropping a coin into a slot in the machine; and also certain vending machines whereby passengers may obtain chewing gum and candy by inserting a coin in the machine and pressing a lever. The question before this Court is whether the City, through its Rapid Transit Board, gave to the defendant the right to maintain these machines in the stations of the subway by the lease of the railroad and its appurtenances. This right is shown upon the trial to be worth $50,000 a year to the defendant, and it is strongly urged by the defendant's counsel that such machines are incidental to the operation of all railways, and that the lease of the subway to the defendant, being silent upon that subject, carries with it the rights incidental to the enjoyment of the leased property and all rights which plaintiff itself could enjoy had it operated the railroad instead of leasing it to defendant. Plaintiff's counsel, on the other hand, has argued with equal persistency that the instrument under which defendant operates the subway is a grant or franchise which must be most strictly construed against the grantee (*citing Ogden* v. *Jennings,* 62 N. Y., 526), and that the instrument being silent on the question of the right to maintain these machines, no such right can be implied.

An application for an injunction *pendente lite* was made to my learned colleague, Mr. Justice Bischoff (*Interborough R. T. Co.* v. *City of N. Y.*, 47 Misc. 221), wherein he said: "The statute which empowered the Board to make the contract for the construction and lease of the road is very broad in its scope, and may well be read as authorizing the lease of the property in such a manner as to afford the lessee every benefit which custom attaches to the operation of a railway, and the contract thus recognizes the right of the lessee to maintain advertising signs upon the stations since the manner in which the advertising matter shall be displayed is regulated by the contract. * * * Upon the question of custom in the maintenance of railroad property enough has been shown to support plaintiff's case prima facie, and custom must enter into the inquiry as an important factor in the determination of the extent of this lessee's incidental powers of dominion over the property which is the subject of the lease. It is made to appear that advertising privileges and the maintenance of newsstands afford a very extensive revenue, which is customarily taken into account as a part of the legitimate earnings of railroads, and that the maintenance of newsstands, vending and weighing machines and advertising signs is, as an incident to the operation of railways, practically universal. If this be the fact, as disclosed upon a full hearing, then, presumably, the contract had reference to the custom, and the statute intended the existence of power in the Board to contract accordingly, since the maintenance of a railroad according to the modern standards was to result from the enterprise undertaken."

Upon the trial had it has been demonstrated that these various privileges are incidental to the operation of a road; that they afford a great source of revenue, and their use and maintenance is practically a universal custom. This Court cannot now, in the guise of an action to restrain the maintenance of these machines, reform that contract or make a new one for the parties. The lease gives the plaintiff no right to re-enter the demised premises except upon the violation of the terms of the lease by the defendant, and it is clear that if the defendant were restrained and prevented from maintaining these machines the plaintiff could not enter upon the subway, maintain the machines and receive the revenue therefrom, so that the result of preventing their maintenance would be to deprive the defendant of a large revenue flowing from a perfectly legitimate source and based upon an almost universally established custom, without giving plaintiff any corresponding advantage. It is true that the defendant is bound to use the demised property as a railroad, but the instrument by which the defendant is in possession is none the less a lease. It is everywhere referred to as a lease. It partakes of all the qualities of a lease and plaintiff's position that it is a grant or franchise is untenable. "A lease for years is a contract between lessor and lessee for the possession and profits of lands and tenements on the one hand, and a recompense by rent or other consideration on the other." (*McAdam on Landlord and Tenant,* 127). "A grant is an absolute conveyance of property by the sovereign, and that conveyance is only defeasible by eminent domain upon proper compensation" (*Langdon* v. *Mayor, etc.,* 93 N. Y., 129). "A franchise is a special privilege conferred by the government on individuals which does not belong to the citizens of a country generally by a common right." (*Bank of Augusta* v. *Earle,* 13 Peters, 519). "A special franchise is the right granted to a corporation to construct, maintain or operate in a public highway some structure intended for public use, which, except for the grant, would be a trespass." (*People ex rel. Met. St. R'y* v. *Tax Comm'rs,* 174 N. Y., 417).

The City has built and now owns a railroad, but it has leased it for a term of fifty years to the defendant. That instrument is not a grant nor is it a franchise, and it must be interpreted and read according to the rules of construction pertaining to leases. Plaintiff could lease nothing more than it had as landlord; it could not grant a right to the tenant to maintain machines upon the demised premises unless it could have maintained the machines itself. The plaintiff has assumed upon the trial the position that the Board of Rapid Transit Commissioners had the power, as suggested by MR. JUSTICE BISCHOFF, to permit the machines, but that as nothing was said in the contract or lease that power was not exercised, and so remains in the Board to be exercised when defendant makes proper application and compensation. The Board then possessed a power that was given it by an act of Legislature authorizing it to build a railroad, and since it is conceded that it possessed the right to permit the maintenance of these machines in question, it must necessarily have secured that power as an incident to its right to construct the railroad, for the Legislature gave the City no other right. There has never been any serious doubt of the right of the municipality to use its property for purposes other than strictly public purposes so long as the primary public purpose is served (*French* v. *Inhabitants of Quincy,* 3 Allen, 9). There certain premises were granted to a town upon condition that it should not be used for any other purpose than as a town house. The town erected upon the premises a much larger building than was then required for town necessities, and rented parts not so occupied for a tailor shop, clothing shop, bank, apothecary shop and saloon, and the Court held that such use was not violative of the conditions upon which the premises were granted. That decision was followed in other States and in our own Courts. The right to so utilize public property was discussed by the Appellate Division in the case of the *New York Mail and Transportation Co.* v. *Shea* (30 App. Div., 266), where it was held that the city had the right to permit the plaintiff company to carry its tubes for the transportation of mail across the Brooklyn Bridge.

The plaintiff in the case at bar, however, contends that notwithstanding the power in the plaintiff to so utilize the subway, the defendant has no power to maintain the machines, and that such maintenance is *ultra vires* of the defendant. While it is true that in deciding whether any act is beyond the power of the corporation, the Courts must look into the circumstances of each particular case, yet that doctrine will always be reasonably applied. The proof shows that vending and weighing machines are now commonly maintained in railroad stations and on platforms of the elevated roads and in ferry terminal houses generally, in the City of New York and elsewhere. The right of the elevated railroad to condemn land was once questioned, because it permitted its property to be used for other than railroad purposes by allowing newsstands on its stations, and the Supreme Court declared it to be an extraordinary proposition to say that the right of a railroad to condemn real estate could be questioned because it used some of its property for a purpose not strictly a railroad purpose, but which was a great convenience to passengers (*Matter of Met. El. RR.*, 18 State Reporter, 134). A large number of collateral uses of railroad property have been sustained, such as the right to maintain weighing machines (*London and Northwestern RR.* v. *Price*, L. R., 11 Q. B. D., 485), and a hotel and summer resort were held to be within the powers of a railroad (*Jacksonville, &c., RR.* v. *Hooper,* 160 U. S., 514), and the right of a ferry to run excursions with its surplus boats not needed for ferry purposes (*Forest* v. *Manchester R'y,* 30 Beav., 40), and to maintain refreshment stands in stations (*Flanagan* v. *Great Western RR.*, L. R., 7 Equity, 116); and in *Brown* v. *Winnisimmett Co.* (11 Allen, 326), the Court stated that there was no rule or principle by which an act creating a corporation for a certain specific object could be construed as prohibitive of all other dealings not within the exact scope of its charter, and saying that a corporation may engage in business incidental to its main business where it may become necessary, expedient or profitable in the care and management of its property.

It is thus clear that the maintenance of the machines in question would not be an act *ultra vires* of either of the parties hereto, and that had plaintiff not leased its property to defendant, it would have had the right to maintain such machines as incidental to the operation of the subway. Having leased the road to the defendant without restriction or reservation as to this right, I am of the opinion that such right passed to the defendant as an incident to the enjoyment of the demised property, and that the defendant has the right to their maintenance so long as it does not interfere with the careful and skilful operation of the road according to the highest standard of railroad operation, and does not deprive the public of any of the rights to which it is entitled. The plaintiff has failed to show that the placing or maintaining of these various machines in any way interferes with the public's full enjoyment of all their rights; they have failed to establish that the same in any shape constitute an obstruction or are in any way offensive, or by their existence on the various stations prove themselves a nuisance or annoyance. Quite to the contrary, the proof would establish and warrant the conclusion that they are purposely placed where obstruction or interference with the public is absolutely impossible; they are availed of by the travelling public as a convenience and privilege the removal of which would prove a deprivation of rather than the re-establishment of their rights.

Being, therefore, of the opinion that the lease of the subway by the Rapid Transit Board to the defendant gave to the defendant the right to maintain such machines so long as they do not in any way interfere with the use by the public of the railroad or deprive the public of any right to which it is entitled, judgment must be directed for defendant, with costs.

(Decided, 24 December, 1906.)

APPENDIX III.

CERTIFICATE OF THE BOARD TO THE NEW YORK AND JERSEY RAILROAD CO.

BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS FOR THE CITY OF NEW YORK

TO

NEW YORK AND JERSEY RAILROAD COMPANY.

CERTIFICATE.

MODIFYING TERMS OF CERTIFICATE DATED FEBRUARY 2, 1905.

The Board of Rapid Transit Railroad Commissioners for The City of New York does hereby certify as follows:

WHEREAS, The New York and Jersey Railroad Company (which is hereinafter called the Tunnel Company) is a railroad corporation which has been duly incorporated under the laws of the State of New York for the purpose (among other things) of constructing and operating a tunnel railroad in the City of New York (which city is hereinafter called The City), to be connected with a railroad or railroads within the State of New Jersey and thereby forming a continuous line for the carriage of passengers and property between a point or points within, and a point or points without the City: and

WHEREAS, The Board of Rapid Transit Railroad Commissioners for the City of New York (which is hereinafter called the Board) by a Certificate dated the second day of February, 1905, did grant to the Tunnel Company the right and franchise to extend its road (which said road had been theretofore duly authorized) from the intersection of Greenwich and West Tenth and Christopher streets, in the Borough of Manhattan, under Christopher street to Sixth avenue; thence with one branch under Sixth avenue to a terminal station at or near the intersection of Sixth avenue and Thirty-third street, in said Borough, and with another branch crossing diagonally under Sixth avenue to Ninth street, and thence easterly under Ninth street to a terminal station at or near the intersection of Fourth avenue and Ninth street, in said Borough; and

WHEREAS, The said Certificate provided that all plans for and the method of doing the work, including all plans for stations and station arrangements should from time to time be subject to the approval of the Board; and

WHEREAS, The said Certificate by Article X thereof further provided that in case the City or the Board should at any time or times thereafter determine that the portion of the tunnel and railroad thereby authorized under Sixth avenue, between the north line of Ninth street and the south line of Thirty-third street, or the portion under Ninth street east of Sixth avenue, or either of them, should be necessary or desirable for use as a part of some municipal system of rapid transit to be owned by the City, the City should have, and the Tunnel Company thereby granted to the City, the right and option to purchase and take such portion of the tunnel and railroad thereby authorized at the time or times and upon the terms therein particularly mentioned, and upon the payment or tender by the City of the value of such portion of the said tunnel and railroad, such value, however, not to exceed the actual cost in money of the construction of the said portion of the said tunnel and railroad, including cost of stations, real estate, and any and all easements, structures and property connected therewith, as the same might exist at the time when said option should be exercised; and

WHEREAS, The Tunnel Company heretofore presented to the Board for its approval a plan for the said terminal station at the intersection of Sixth avenue and Thirty-third street, to be located in the easterly portion of the block bounded by Sixth avenue, Thirty-second street, Thirty-third street and Seventh avenue and extending back from Sixth avenue for a distance of four hundred feet, which plan was dated February 5, 1906, and marked "Terminal at 33rd St.," and was approved by the Board upon condition that the Tunnel Company would give an assurance in writing that it would not claim that the provisions of Clause X of the said Certificate, dated February 2, 1905, relating to an option to the City to purchase certain property of the Tunnel Company, applied in any way to the said terminal station; and

WHEREAS, The Tunnel Company in order to obtain the approval of the Board to the said plan has given assurance in writing that the said option above referred to and the provisions for the exercise thereof would not be claimed by the Tunnel Company to apply to the said terminal station; and

WHEREAS, It is to the interest of both the City and the Tunnel Company to define more clearly by a supplemental agreement the property intended to be included in the option above referred to, and also to fix, limit and define the right of the City to take a part of the said terminal property for railroad uses, and to make provision for ascertaining the value of the part so taken in order to avoid the uncertainty, delay and expense of condemnation proceeding, and it is therefore proposed, with the consent of the Tunnel Company, to modify the terms of the contract constituted by the delivery of said Certificate of February 2, 1905, and its acceptance by the Tunnel Company, by adding thereto provisions which shall express more clearly the understanding of the parties hereinbefore recited, to the effect that the said option and the provisions of said Certificate for the exercise thereof do not apply to the said terminal station, and shall also secure to the City, in case it shall exercise such option, the right to acquire in addition such an easement in that part of said terminal station beneath the surface then used for railroad purposes as shall be necessary for the proper use by the City of said tunnel and railroad under Sixth avenue; and

WHEREAS, To the end and for the purpose hereinbefore recited, the Board has, by a concurrent vote of at least six of its members, determined upon the modifications of the said contract with the Tunnel Company hereinafter set forth, and has prescribed such terms, conditions and requirements in relation thereto as to it appear just and proper, including all the terms, conditions and requirements provided for by the Rapid Transit Act in case of such modification;

Now, THEREFORE, The Board, with the consent of said Tunnel Company, does hereby modify said Certificate dated February 2, 1905, by adding thereto the following provisions:

FIRST.

In case the City or Board shall exercise the right or option granted to the City by Article X of the said Certificate dated February 2, 1905, so far as the same relates to the portion of the tunnel and railroad authorized by the said Certificate under Sixth avenue, between the north line of Ninth street and the south line of Thirty-third street, the property to be taken shall include, besides the said portion of said tunnel and railroad, the stations along the line of said portion of said tunnel and railroad, and the real estate and any and all easements, structures and other property connected therewith, as the same exist at the time when the said option shall be exercised; but shall not include so much of the said terminal station as is located within the block bounded by Sixth and Seventh avenues and 32d and 33d streets. The City shall not be required, nor shall it be deemed to have the right or option, except as hereinafter provided, to take or pay for any part of the said terminal station so located, but only so much thereof as is or may be situated within Sixth avenue or 32d street or 33d street And the Tunnel Company, by its acceptance of this Certificate, agrees to the statement in this paragraph contained in respect to the extent and scope of said right or option, both as to the property covered by it and as to the property not covered by it, and covenants that it will not make any claim to the contrary in case the said right or option shall be exercised by the City or the Board.

SECOND.

In case the City or the Board shall exercise the right or option granted to the City by Article X of the said Certificate dated February 2, 1905, so far as the same relates to the portion of the tunnel and railroad authorized by the said Certificate under Sixth avenue between the north line of 9th street and the south line of 33d street, the City shall have, and the Tunnel Company by its acceptance of this Certificate grants to the City, the right or option to purchase and take such estate or estates, interests, rights and easements as shall be requisite for the purpose in and to so much of the said terminal station, situated in the said block between Sixth and Seventh avenues and 32d and 33d streets, beneath the surface and then used for station purposes in connection with the said tunnel and railroad, as the City or the Board shall determine to be necessary for railroad or station purposes in connection with said tunnel and railroad under Sixth avenue after the same shall have been acquired by or on behalf of the City. Such rights or easements shall be limited in respect of their vertical dimensions by plane surfaces, called for convenience the "Upper" and "Lower" limits.

The Lower limit of the said rights or easements shall be a plane surface not lower than two feet below the level of the top of the rail of the tracks as then constructed and operated in said terminal station, and the Upper limit of the said underground rights or easements shall be a plane surface not higher than fourteen feet above the level of the top of said rails.

The City, however, shall also have the right to acquire, maintain and operate such of the approaches and stairways to the said railroad and tunnel or terminal station which may have been theretofore constructed and may then be in use by the Tunnel Company, as the City or the Board may deem necessary.

In case the City or the Board shall determine to acquire any such portion or portions as aforesaid of the property of the Tunnel Company within the said block, the City or the Board shall give the Tunnel Company notice thereof, at the time of giving notice that it has determined to exercise the option granted by Article X of the said Certificate of February 2, 1905; and in such notice the City or the Board shall state the particular estate or estates, interests, rights or easements to be taken or acquired pursuant to this Article, and shall annex thereto a map or plan indicating the same. Upon the day fixed by said notice for such acquisition, the City shall pay or tender to the Tunnel Company the value of such estate or estates, interests, rights or easements in the said property lying within the block bounded by Sixth and Seventh avenues and 32d and 33d streets, so taken and acquired, as such value may have been determined by agreement, or by appraisal in the manner provided in Clause XI of the said Certificate of February 2, 1905.

The value of the said estate or estates, interests, rights or easements may be fixed and determined by an agreement in writing between the Tunnel Company and the Board. If the Tunnel Company and the Board shall not have reached such an agreement on or before the day one year before the date fixed for the purchase of the said estate or estates, interests, rights or easements in the said property, then and in that event, the value of the said estate or estates, interests, rights or easements shall forthwith be determined by arbitration in the manner provided in Clause XI of the said Certificate dated February 2, 1905; and the said Certificate dated February 2, 1905, is hereby modified, so that said Article XI shall apply to any arbitration under this certificate.

The Tunnel Company, by its acceptance of this Certificate, covenants and agrees that it will not hereafter question the right, power or authority of the City to acquire or hold any of the estate or estates, interests, rights or easements which the City may acquire, or is given the right or option to acquire, from the Tunnel Company pursuant to the provisions of this Certificate, whether any such right, power or authority be now possessed by the City or shall be hereafter acquired by it by virtue of future legislation or otherwise; and that the said Tunnel Company, by the acceptance of this Certificate, is estopped from questioning the authority of the City or the Board to modify the said Certificate of February 2, 1905, to the extent and in the manner hereinbefore provided. And the Tunnel Company, by its acceptance of this certificate, covenants for itself, its successors and assigns, to make such further grants, conveyances and other instruments of assurance, necessary or appropriate to carry into effect the purposes of the agreement arising out of this Certificate and its acceptance by the Tunnel Company, as may be reasonably demanded by the City or the Board.

In Witness Whereof, This certificate has been prepared by the Board of Rapid Transit Railroad Commissioners for The City of New York, by and upon the concurrent vote of at least six of the members of the said Board, and is now attested by its seal and by the signature of its President, who is its presiding officer, and by the signature of its Secretary, this twelfth day of April, 1906.

THE BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS FOR THE CITY OF NEW YORK.

By A. E. Orr,
President.

(SEAL OF THE BOARD.)

Bion L. Burrows,
Secretary.

State of New York, }
County of New York, } ss.

On the 24th day of April, 1906, before me personally appeared Alexander E. Orr and Bion L. Burrows, to me known and known to me to be, the said Alexander E. Orr, the President, and the said Bion L. Burrows, the Secretary of the Board of Rapid Transit Railroad Commissioners for the City of New York; and the said Alexander E. Orr and Bion L. Burrows, being by me duly sworn, did depose and say, each for himself and not one for the other, the said Alexander E. Orr, that he resides in the Borough of Brooklyn, in the said City, that he is the President of the said

Board and that he subscribed his name to the foregoing contract by virtue of the authority thereof; and the said Bion L. Burrows, that he resides in the Borough of Brooklyn, in the said City of New York, that he is the Secretary of the said Board, and that he subscribed his name thereto by like authority; and both the said Alexander E. Orr and Bion L. Burrows that they know the seal of the said Board, that the seal affixed to the foregoing instrument is such seal, and that the same was affixed thereto by the authority of the said Board and pursuant to a resolution duly adopted by the said Board.

H. A. D. HOLLMANN,
Notary Public for Kings County, N. Y.

(NOTARIAL SEAL.)

Certificate filed in New York.

NEW YORK AND JERSEY RAILROAD COMPANY hereby accepts the foregoing Certificate and all the terms, conditions and requirements thereof, and expressly consents to the modifications of the contract constituted by the Certificate of February 2, 1905, as above set forth.

Dated New York, April 26th, 1906.

NEW YORK AND JERSEY RAILROAD COMPANY.

By W. G. McADOO,
President.

(CORPORATE SEAL)

CHARLES W. KING,
Secretary.

STATE OF NEW YORK, }
COUNTY OF NEW YORK, } ss.

On this 26th day of April, 1906, before me personally came William G. McAdoo and Charles W. King, to me known and known to me respectively to be the said William G. McAdoo, the

President, and the said Charles W. King, the Secretary, of New York and Jersey Railroad Company; and being by me duly sworn, they did depose and say, each for himself and not one for the other, the said William G. McAdoo, that he resides at Yonkers, in the State of New York, and is the President of the New York and Jersey Railroad Company, the corporation named in and which executed the foregoing consent, and that he subscribed his name to the foregoing consent by the authority of the Board of Directors thereof; and the said Charles W. King that he resides in the Borough of Brooklyn, City of New York, in the State of New York, that he is the Secretary of the said New York and Jersey Railroad Company, and subscribed his name to the foregoing consent by like authority; and both the said William G. McAdoo and Charles W. King that they know the seal of the said New York and Jersey Railroad Company, that the seal affixed to such consent is such seal, and that the same was affixed thereto by authority of the Board of Directors of the said New York and Jersey Railroad Company, and pursuant to a resolution adopted by the said Board.

WM. H. BRUDER,
Notary Public, New York County.

(NOTARIAL SEAL.)

REPORT

OF THE

CHIEF ENGINEER

New York, January 1, 1907.

ALEXANDER E. ORR, *President,*
Board of Rapid Transit Railroad Commissioners,
City of New York.

Sir:—I have the honor to present to you a report upon the work done on the Manhattan-Bronx and the Brooklyn-Manhattan Railroads, known as Contracts Nos. 1 and 2, respectively, during the calendar year 1906, as well as to report on other work accomplished during the year under the supervision of the engineering department of the Board.

CONTRACT NO. 1.

Of regular construction work little remained to be done on the Manhattan-Bronx Railroad at the end of 1905. The East Side branch was in operation to its northern terminus at One Hundred and Eightieth street, and the West Side branch was operated as far as the One Hundred and Fifty-seventh street and Broadway station, the tracks between One Hundred and Fifty-seventh street and One Hundred and Sixty-eighth street stations being used for the purposes of switching and storage.

During the year 1906, the operation of trains on the West Side branch was extended north to a temporary station at Two hundred and Twenty-first street and Broadway. Beginning Monday, March 12, two shuttle trains were operated between One Hundred and Fifty-seventh street and Two hundred and Twenty-first street stations at 12-minute and 16-minute intervals. These shuttle trains stopped at Dyckman street, Two hundred and Fifteenth street and Two hundred and Twenty-first street stations, the stations at One Hundred and Sixty-eighth street and One Hundred and Eighty-first street not being ready for operation at that time.

On Saturday, April 14, the One Hundred and Sixty-eighth street station was opened to the public, the shuttle trains still being in use.

On Wednesday, May 30, the One Hundred and Eighty-first street station was operated. At this time the shuttle trains were discontinued, some of the express trains being run through to Two Hundred and Twenty-first street, and the remainder of the express trains running through to One Hundred and Sixty-eighth street station.

The station at Two Hundred and Seventh street was completed during the year, but was not opened to the public as it could not be of material use until the bridge over the Harlem river at Two Hundred and Seventh street was completed.

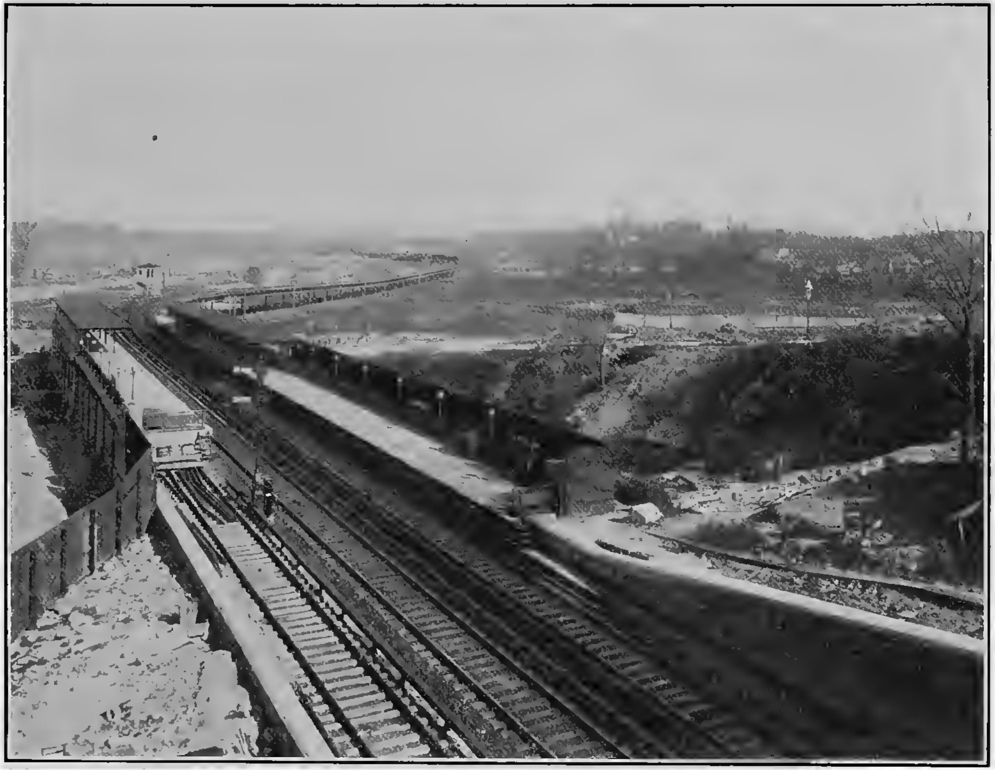
During the spring and summer a large amount of extra work was done both at and between stations, in order to provide additional ventilation. This work was begun at City Hall on May 10, and practically completed on December 30.

The work consisted of cutting out a portion of the vault lights over the platforms at most of the stations between Brooklyn Bridge and Ninety-sixth street, and installing open gratings, for the purpose of admitting air from the street to the stations. In many cases copper pans were placed under the gratings to intercept the drainage.

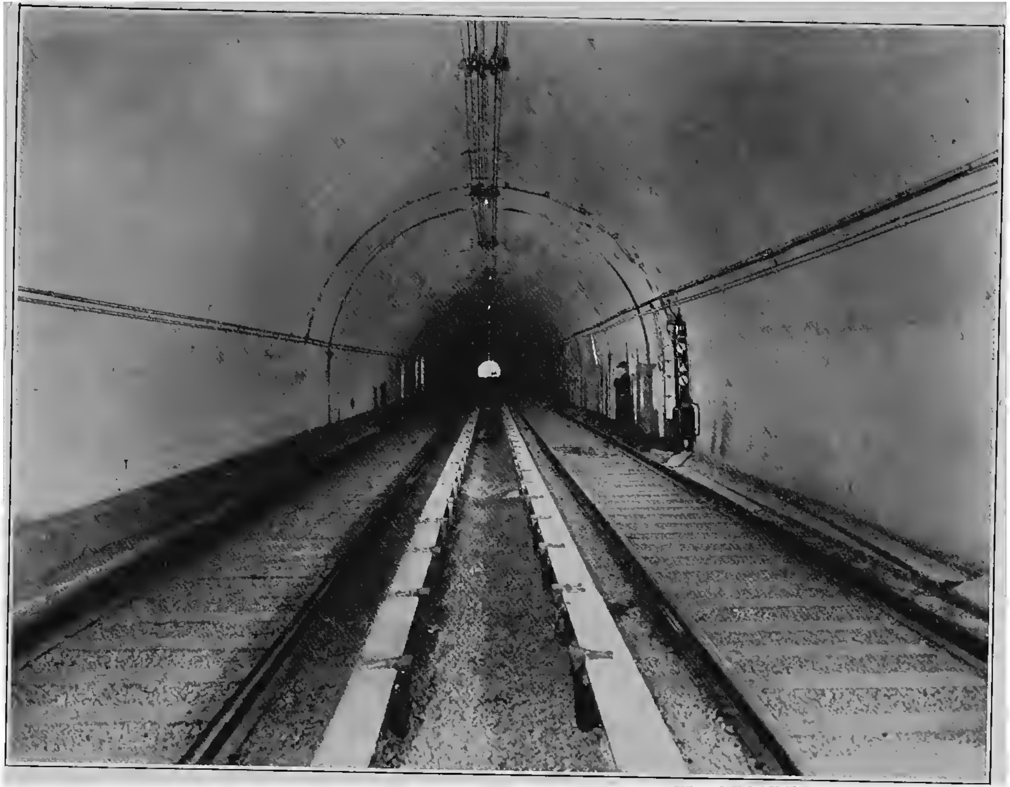
In addition to the installation of the gratings at the stations, ventilating chambers were constructed adjacent to the sidewalls of the subway at the following points: City Hall Park, Duane street, Franklin street, Grand street, Prince street, Fourth street, Eleventh street, Sixteenth street, Twentieth street, Twenty-fifth street, Thirty-first street, Bryant Park, Forty-sixth street, and Fifty-fifth street. Some sewer reconstruction was necessary to be done along these ventilating chambers, which was completed during the year, as shown in table accompanying the report of work done by the Sewer Division, hereinafter submitted.

The maximum force employed on this work was in the month of July, when the number of men per day averaged a little over 900.

The above is merely a summary of the general progress made on this work of ventilation, the subject as a whole being treated elsewhere in this report.



Looking North from Dyckman Street Station, Showing Elevated Structure.



Completed Tunnel, Near Fort George, Looking North.

The amount of regular construction work on sections not wholly completed is given seriatim as noted below.

Section 8.—From the centre line of One Hundred and Tenth street and Lenox avenue to 100 feet north of the centre line of One Hundred and Thirty-fifth street and Lenox avenue.

On this section the resurfacing of the New York City Railway Company's Lenox avenue tracks was completed.

Section 9A.—From a point 100 feet north of the centre line of One Hundred and Thirty-fifth street and Lenox avenue to the centre line of Gerard avenue, in the Borough of The Bronx.

Resurfacing of the New York City Railway Company's tracks was also completed on this section.

Lenox Avenue Extension.—A small amount of resurfacing of the New York City Railway Company's tracks completed this section.

Section 9B.—From the centre line of Gerard avenue to the west building line of Brook avenue and Westchester avenue.

At Mott avenue station the superstructure was completed, the elevators were opened to the public, and the station finish work practically completed.

The erection of the concrete fence on the retaining walls at the Gerard street portal was begun, and the foot bridge over the subway placed. The treatment of the plaza at this point will be begun as soon as weather conditions permit, it not having been possible to do this work at the close of the year, waiting for warmer weather to prevail.

Sections 13 and 14.—From the north building line of One Hundred and Thirty-third street to Hillside avenue, at Fort George.

During the year the brick arch at One Hundred and Eighty-first street station and the lining of the shafts and concrete and brick work for the ticket offices at both One Hundred and Sixty-eighth street and One Hundred and Eighty-first street stations were completed. The elevators were also installed, and the stations practically finished, with the exception of some iron grille work at One Hundred and Sixty-eighth street station and the work of repairing some of the face brick of the station arch damaged by fire in March, 1905.

The Dyckman street station was also completed during the year.

Section 15.—Viaduct from Fort George northerly to The Bronx at Kingsbridge.

The work of erection of the Two Hundred and Seventh street station was completed during the year.

The new bridge over the Harlem Ship Canal is practically completed. The old draw span was moved to its new position at Two Hundred and Seventh street on June 14, and the new span put in place on June 16, both operations being successfully carried out by the sub-contractors without mishap.

The foundations for the elevated columns at the north end of Section 15 were begun and completed during the year, all the steel work practically completed, and the track laid. With the exception of some station finish work, the station at Two Hundred and Twenty-fifth street was completed, and temporary stairways provided, allowing for early operation of trains to this station across the draw bridge at the Harlem Ship Canal.

Work on the extension of this viaduct to Van Cortlandt Park, from Two Hundred and Thirtieth street, near Spuyten Duyvil Creek, to Two Hundred and Forty-second street and Broadway, was begun the latter part of the year, excavating for the foundations having been started on December 1, and the work prosecuted thenceforth with all diligence looking to the completion of this extension at the earliest date practicable.

The entire railroad to and including Section 15 will, it is expected, at the present rate of progress be now shortly in operation, and by next summer the extension to Van Cortlandt Park completed and trains operated also over that branch.

The following table gives, under the captions noted, the chief items of work done on each section for which the Contractor has been paid, from the beginning of construction to December 31,

TOTAL AMOUNT OF CONTRACT WORK DONE ON CONTRACT NO. 1, BY E

ITEM.	Quantity.	*Sec. 1.	*Sec. 2.	*Sec. 3.	*Sec. 4.	*Sec. 5-A.	*Sec. 5-B.	*Sec. 6-A.	*Sec. 6-B.	*Sec. 7.	*Sec. 8.	*Sec. 9-A.	*Sec. 9-A. (River.)	Sec. 9-B.	*Sec
Earth Excavation	Cu. Yds.	127,543.5	289,310.87	341,653.49	1,137.7	159,982	100,584	149,391	175,844	8,482.63	161,437.19	70,565.52	62,960.65	110,627.09	9,05
Rock Excavation	"	......	......	99,785.75	6,288.8	123,082.58	87,604	145,462	146,643	3,854.23	129.81	13,767.18	1,888.79	56,843.44	75
Tunneling	"	......	......	......	68,909.9	......	......	......	......	74,439.17	......	......	......	557.66	...
Shaft Excavation	"	......	......	......	......	......	......	......	......	308.89	......	......	......	......	...
Portland Cement Concrete..	"	21,122	45,673.31	62,774.87	18,986.4	35,747.78	26,448.8	44,172.5	50,363	14,744.73	33,128.58	19,342.65	15,538.74	33,765.54	4,52
Natural Cement Concrete...	"	......	......	......	......	......	38.4	......	......	......	......	......	......	......	...
Steel Erected	Tons.	2,511.236	5,246.019	7,666.339	34.61	4,664.052	2,869.164	5,046.694	5,806.057	165.4	3,016.085	1,074.2805	12.3195	879.95	11,05
Cast Iron Erected..........	"	......	197.908	310.385	......	104.532	92.491	104,685	195,285	......	152.692	0.8415	2,156.412	45.03	21
Brick Masonry (common)...	Cu. Yds.	1,124.7	2,979.51	3,875.42	......	2,186.21	1,583.2	2,439.8	2,896	1,051.86	2,510.13	939.39	......	1,540.34	...
Brick Masonry (facing).....	"	......	......	......	......	......	......	36.93	41.9	......	......	......	......	......	...
Brick Masonry (enameled)..	"	......	......	......	......	......	282.84	25.5	......	......	22.71	......	......	......	...
Pedestal Masonry	"	69.75	497.07	867.2	......	414.94	409.78	701.64	442	17.44	253.29	43.87	......	37.12	32
Cut Stone Masonry.........	"	......	......	......	......	......	......	18.2	19	......	......	......	......	......	...
Restoring Street Surface....	Sq. Yds.	9,512.7	12,467.57	56,937.12	726.1	31,010.97	25,636.6	28,876.3	25,503	176.96	24,770.73	7,639.78	......	14,538.36	...
Restoring Park Surface.....	"	465.6	......	......	......	59.16	......	11,852.4	10,663	2,007.82	......	......	......	......	...
Repaving	"	......	......	......	......	......	......	......	......	......	......	......	......	......	1,30
Vault Lights	"	1,443.9	1,986.53	2,558.45	......	1,102	1,069.45	353.7	1,353.4	......	1,088	......	......	133.05	...
Steel Delivered	Tons.	2,511.236	5,246.019	7,699.673	......	4,708.66	2,871.755	5,046.694	5,809.121	165.4	3,016.085	1,074.2805	12.3195	880,622	11,019
Cast Iron Delivered........	"	......	197.908	330.744	......	104.532	92.491	104.685	195.285	......	152.692	0.8415	2,156.412	45.03	22
Expended on Stations.......	Dollars.	39,629	78,222	119,723	......	43,108	44,436	47,501	71,722	......	64,359	......	......	19,686	103,75
Waterproofing	Sq. Yds.	32,328.4	100,790.8	145,061.01	1,305.5	71,345.29	59,084.2	103,351.8	100,317	4,742.52	75,073.32	29,324.53	10,304.2	44,893.62	...
Water Pipes, 48-inch........	Lin. Ft.	......	......	......	......	3,495.5	......	440.6	......	......	175.9	......	......	......	...
Water Pipes, 36-inch........	"	......	5,794.3	848	......	519	7.4	913.2	2,667	......	......	......	......	......	...
Water Pipes, 30-inch........	"	......	......	......	......	60.8	357.1	......	......	......	323.5	......	......	......	...
Water Pipes, 24-inch........	"	82	......	......	......	......	......	......	209	......	523.5	......	......	......	...
Water Pipes, 20-inch........	"	......	354.9	298	......	1,706.3	1,339.3	6,356.8	6,194	110	561.33	......	......	......	...
Water Pipes, 16-inch........	"	......	......	230	......	12	......	......	......	......	......	......	......	......	...
Water Pipes, 12-inch........	"	211	6,823.7	6,261	......	1,211.39	1,261.4	1,416.6	1,167	......	1,271.13	......	......	286	1
Water Pipes, 8-inch........	"	......	......	......	......	......	......	......	......	......	......	......	......	......	...
Water Pipes, 6-inch........	"	810.5	3,016	9,976.9	......	1,070.43	388.1	155.6	200	......	793.39	......	......	6,283.02	8
Water Pipes, 4-inch........	"	......	......	......	......	46	205.7	......	......	......	......	......	......	......	...
Water Pipes, 3-inch........	"	......	......	......	......	110.4	......	......	......	......	......	......	......	......	...
Water Pipes, 2-inch........	"	......	......	......	......	170	......	......	......	......	......	......	......	......	...
Gas Pipes, 36-inch..........	"	......	......	......	......	......	......	134.5	......	......	......	......	......	......	...
Gas Pipes, 30-inch..........	"	......	5,662	186.3	......	253.8	......	243.2	......	......	996.36	......	......	......	...
Gas Pipes, 24-inch..........	"	......	......	241	......	......	......	520.9	......	......	......	......	......	......	...
Gas Pipes, 20-inch..........	"	......	376	262.4	......	1,896.54	1,068	630.8	......	110	126.61	......	......	......	...
Gas Pipes, 16-inch..........	"	211	610.5	301.5	......	......	65	......	297	......	239.85	......	......	......	...
Gas Pipes, 12-inch..........	"	105	395.5	247.2	......	1,124.81	148	115.4	......	......	890.36	......	......	......	...
Gas Pipes, 10-inch..........	"	......	252	514.4	......	378.5	......	170.7	......	......	595.11	......	......	186	...
Gas Pipes, 8-inch..........	"	90	5,493.8	15,592.9	......	2,621.5	18	440.7	434	......	......	......	......	263	...
Gas Pipes, 6-inch..........	"	867	8,113.1	14,518.5	......	1,204	612	949.8	2,194	......	4,467.73	......	......	......	1
Gas Pipes, 4-inch..........	"	324	1,325.3	4,518.9	......	355	......	110.9	......	......	890.44	......	......	......	...
Gas Pipes, 3-inch..........	"	46	......	......	......	......	......	......	......	......	......	......	......	......	...
Drain Pipes, 15-inch........	"	......	......	......	......	......	......	......	......	......	......	......	......	291	...
Drain Pipes, 12-inch........	"	......	......	1,112.7	......	247	153	475.5	501	4,578	139	......	......	33	...
Drain Pipes, 10-inch........	"	......	......	2,829.2	1,493.10	3,410.3	3,991.4	6,701.2	2,353	......	......	......	......	......	...
Drain Pipes, 8-inch........	"	......	......	4,119.8	923.8	1,242.4	1,568.6	3,114	4,197	......	203	......	......	307	24
Drain Pipes, 6-inch........	"	130.6	......	3,620.7	1,751.7	3,221.8	1,632	2,052	4,584	......	265.53	......	......	547.5	38
Drain Pipes, 4-inch........	"	63.1	784.9	1,011.7	420.4	317.1	2,016.1	3,861.2	7,652	......	700.23	......	......	164.50	...
Drain Pipes, 3½-inch........	"	......	......	671.2	......	......	......	......	......	......	......	......	......	......	...
Drain Pipes, 3-inch........	"	376.48	153	3,542.6	3,294.2	1,881	......	523.4	124	6,658.4	234.3	......	......	782.70	...
Steam Pipes, 10-inch........	"	105	......	......	......	......	......	......	......	......	......	......	......	......	...
Mail Tubes	"	3,879.3	1,977	14,948.6	247.1	......	......	......	......	......	......	......	......	......	...
Edison Ducts	"	5,578	13,591	10,765.1	......	......	......	......	......	......	......	......	......	......	...
Empire City Ducts..........	"	38,388	24,648	70,954.9	......	......	......	......	......	......	......	......	......	4,722	...
Empire City Blow Pipes.....	"	296	......	2,652.2	......	......	......	......	......	......	......	......	......	......	...
Fire Alarm Ducts..........	"	......	......	......	......	......	......	......	......	......	......	......	......	......	...
Metropolitan St. Ry. Ducts..	"	......	2,088	......	......	......	......	......	......	......	......	......	......	......	...
Western Union Tubes.......	"	2,880	......	356	......	......	......	......	......	......	......	......	......	......	...
Track Laid (single):															
Main Line	"	6,969.63	23,819.36	31,756.45	8,001.92	17,210.40	14,520	25,380	23,209	9,156	13,494.60	5,509.47	3,000	8,480.68	31,09
Sidings	"	......	......	819.11	......	148	......	448	594	......	319.67	345.71	......	......	...
Turnouts and Crossovers	"	1,175.75	493.27	763.17	......	661	......	659.7	1,795	......	109.67	295.17	......	......	1,24

NOTE.—Sections marked * denote Final Quantities.

NO. 1, BY EACH SUB-CONTRACTOR TO DECEMBER 31, 1906.

	Sec. 9-B.	*Sec. 10.	*Sec. 11.	*Sec. 12.	Sec. 13.	*Sec. 14.	Sec. 15.	Total Work Done, 1900.	Total Work Done, 1901.	Total Work Done, 1902.	Total Work Done, 1903.	Total Work Done, 1904.	Total Work Done, 1905.	Total Work Done, 1906.	Total to Date.
	110,627.09	9,056.74	60,291.12	3,759.4	100,128	4,673	10,055.14	135,425	839,708	691,578	245,462	12,698.33	15,780.48	6,831.23	1,947,483.04
	56,843.44	757.11	90,016.58	149.4	54,500	5,511	356.95	18,453	287,457	393,588	117,603	2,658.03	14,965.20	1,916.39	836,640.62
	557.66	......	......	......	143,387	78,163	......	4,293	136,784	133,049	61,151	14,059.07	632	15,488.66	365.456.73
	......	......	......	......	6,800	....	......	5,705	290	......	....	....	612.89	501	7,108.89
	33,765.54	4,529.3	22,170.27	1,374.14	52,500	20,306	4,239.11	1,619	98,762	209,730	158,477	28,785.43	23,834.64	5,719.65	526,927.72
	......	......	1,401.67	1,211.9	918	....	......	1,189	844	1,907	98	....	—468.03	....	3,569.97
95	879.95	11,051.258	1,592.145	2,010.667	2,012	....	6,938	86	9,294	18,497	18,238.864	12,487.908	1,972.554	2,019.95	62,596.276
2	45.03	213.944	81.22	34.64	116	....	91	......	114	399	2,029.491	574.685	759.8595	20.03	3,897.0655
	1,540.34	......	1,642.72	6.92	3,800	52	......	91	5,352	10,872	9,003	1,529.86	1,090	690.34	28,628.20
	......	......	149.48	11.86	435	7	......	40	......	129	126	29.93	259.24	98.00	682.17
	......	......	......	......	.....	....	......	......	288	33	6.41	3.93	—0.29	....	331.05
	37.12	323.5	135.37	53.08	151	....	120	47	1,689	1,982	753.86	8.02	41.05	16.12	4,537.05
	......	......	872.93	247.22	566	59	......	......	90	697	749	163.2	84.15	—1	1,782.35
	14,538.36	......	1,163.51	217.8	19,377	....	......	......	8,835	49,288	89,482	79,941.06	25,815.08	5,193.36	258,554.50
	......	......	7,943.32	1,450	.....	....	......	......	1,589	322	14,069	15,113.22	3,348.08	....	34,441.30
	......	1,300.41	5,959.28	......	.....	....	94	......	......	507	3,327	2,937	582.69	....	7,353.69
	133.05	......	290.42	......	374	85	......	......	......	2,267	4,400.45	4,526.7	373.92	270.64	11,838.71
95	880,622	11,019.67	1,591	2,010.667	2,012	....	7,184	7,981	22,501	12,025	6,834.755	9,683.298	2,342.527	1,491.622	62,859.202
2	45.03	227	81	34.64	116	....	94	34	462	735	1,605.491	754.685	332.0545	10.03	3,933.2605
	19,686	103,758	39,959	31,783	48,369	....	14,836	......	......	1,300	127,250	477,512	161,029	....	767,091
	44,893.62	......	43,788,78	......	49,487	1,083	......	2,132	219,843	339,627	247,642	39,066.02	19,032.33	4,938.62	872,280.97
	......	......	......	......	.....	....	......	......	3,489	580	42	....	1	....	4,112
	......	......	529.9	......	1,115	....	......	7	6,023	4,633	1,075	597	58.8	....	12,393.80
	......	......	......	......	.....	....	......	70	287	299	25	61	—0.6	....	741.40
	......	......	......	......	.....	....	......	......	......	82	818	....	—85.5	....	814.50
	......	......	5,866.8	......	23	....	......	7,334	10,394	3,757	1,619	260	—553.57	....	22,810.43
	......	......	......	......	.....	....	......	......	12	......	....	....	230	....	242
	286	16	150.3	......	418	....	......	481	3,999	9,127	4,280	2,352	202.52	52	20,493.52
	......	......	54.5	......	.....	....	......	......	......	54	....	....	0.5	....	54.50
	6,283.02	83.8	413.7	......	257	....	......	70	4,356	7,120	4,299	1,732	5.052.42	819.02	23,448.44
	......	......	......	......	.....	....	......	......	117	104	....	31	—0.3	....	251.70
	......	......	......	......	.....	....	......	......	......	......	110	....	0.4	....	110.40
	......	......	......	......	.....	....	......	......	......	......	170	....	....	....	170.00
	......	......	......	......	.....	....	......	......	......	86	38	11	—0.5	....	134.50
	......	......	......	......	.....	....	......	......	1,452	2,123	2,678	949	139.66	....	7,341.66
	......	......	282.7	......	.....	....	......	......	244	803	....	....	—2.40	....	1,044.60
	......	......	......	......	.....	....	......	436	1,553	870	808	529	274.35	....	4,470.35
	......	......	......	......	.....	....	......	......	135	615	806	340	—171.15	....	1,724.85
	......	......	......	......	618	....	......	150	201	456	1,715	1,346	—223.73	....	3,644.27
	186	......	......	......	.....	....	......	......	......	325	619	271	695.71	186	2,096.71
	263	......	......	......	.....	....	......	......	3,679	15,624	5,343	1,738	—1,693.30	263	24,953.70
	......	10	......	......	.....	....	......	240	4,849	11,652	8,951	4,612	2,632.13	....	32,936.13
	......	......	......	......	.....	....	......	250	3,336	874	1,306	408	1,350.54	....	7,524.54
	......	......	......	......	.....	....	......	......	......	......	46	....	....	....	46.00
	291	......	......	......	.....	369	......	......	......	......	291	....	369	....	660.00
	33	......	1,192.37	......	1,732	4,245	......	592	1,344	3,798	3,544	1,980	3,150.57	....	14,408.57
	......	......	1,689.31	......	4,374	....	......	......	5,844	13,414	3,335	4,254	—5.49	....	26,841.51
	307	24	1,674.09	......	4,343	....	......	......	5,028	8,959	5,333	1,484	912.69	....	21,716.69
	547.5	38	438.9	......	2,341	179	......	......	5,942	8,904	4,488	1,205	—123.77	387.5	20,802.73
	164.50	......	82.42	......	314	....	......	......	2,529	7,123	5,188	1,126	1,369.15	52.50	17,387.65
	......	......	......	......	.....	....	......	......	571	......	....	....	100.20	....	671.20
	782.70	......	1,742	......	19,972	8,436	......	......	3,182	11,126	13,141	10,582	5,727.38	3,961.70	47,720.08
	......	......	......	......	.....	....	......	......	......	......	....	....	105	....	105.00
	......	......	......	......	.....	....	......	......	3,888	14,968	1,158	825	213	....	21,052.00
	......	......	......	......	.....	....	......	......	7,928	15,006	6,203	4,462	—3,664.90	....	29,934.10
	4,722	......	......	......	.....	....	......	......	22,159	66,594	22,544	39,666	—16,972.10	4,722	138,712.90
	......	......	......	......	.....	....	......	......	1,086	2,045	755	....	—937.80	....	2,948.20
	......	......	5,990	......	.....	....	......	......	988	5,990	438	....	—550	....	5,990.00
	......	......	......	......	.....	....	......	......	......	2,088	....	....	....	....	2,088.00
	......	......	......	......	.....	....	......	......	......	......	2,500	1,400	—664	....	3,236.00
	8,480.68	31,091.38	11,261.48	4.348	26,865	9,491	13,449	......	......	......	135,000	113,000	30,804.69	8,208.68	287,013.37
	......	......	......	......	.....	....	......	......	......	......	....	....	2,674.49	....	2,674.49
	......	1,249.30	......	324	.....	....	......	......	......	......	....	....	7,526.03	....	7,526.03

TOTAL AMOUNT OF EXTRA WORK DONE, ON CONTRACT No. 1, BY EAC

Lengthening Station Platforms, Third Track, Ducts, etc.

ITEM.	Quantity.	*Sec. 1.	*Sec. 2.	*Sec. 3.	*Sec. 4.	*Sec. 5-A.	*Sec. 5-B.	*Sec. 6-A.	*Sec. 6-B.	*Sec. 7.	*Sec. 8.	*Sec. 9-A.	*Sec. 9-A. (River.)	*Sec. 9-B.
Earth Excavation	Cu Yds.	2,293.80	15,384.58	11,829.15	7.40	3,951.83	2,648	7,781	6,743	320.10	11,746.95	2,986.93	......	3,754.58
Rock Excavation	"	......	......	3,970.23	144.40	3,208.80	2,695	10,735	8,733	303.61	......	456.09	......	6,848.03
Tunneling	"	......	......	......	1,432.2	......	......	......	......	333.5	......	......	......	......
Portland Cement Concrete...	"	294.10	2,919.09	2,418.40	544.30	693.33	603.90	2,189.40	2,959	159.51	2,743.32	770.62	......	2,206.01
Natural Cement Concrete....	"	......	......	......	......	......	......	......	......	......	......	......	......	......
Steel Erected	Tons.	14.130	402.832	143.395	46.070	24.340	......	157.751	264.513	6.288	181.030	52.1899	26.927	95.41
Cast Iron Erected..........	"	5.058	20.886	21.608	......	8.562	41.565	46.830	65.009	......	79.818	17.090	......	26.02
Brick Masonry (common)...	"	113.80	219.92	170.75	......	60.27	105.30	77.20	269	4.54	35.28	12.17	......	24.62
Brick Masonry (facing).....	"	......	......	......	......	......	......	......	......	......	......	......	......	......
Pedestal Masonry	"	......	—32.44	14.36	......	......	......	14.80	—2.80	......	2.81	2.81	......	......
Cut Stone Masonry.........	"	......	......	......	......	......	......	......	......	......	......	......	......	......
Restoring Street Surface....	Sq. Yds.	185.20	1,359.39	1,932.36	......	548.63	667.70	2,374.50	1,754	4	1,234.26	370.01	......	804.36
Restoring Park Surface.....	"	105.30	......	......	......	20.84	......	......	—117.70	82.98	......	......	......	......
Repaving	"	......	......	......	......	......	......	......	......	......	......	......	......	......
Vault Lights	"	......	......	......	......	......	......	......	83.10	......	471.43	64.62	......	......
Steel delivered	Tons.	13.858	402.832	135.926	52.210	24.340	29.751	157.751	265.874	6.288	181.030	52.1899	26.927	91.91
Cast Iron delivered.........	"	......	20.886	4.252	......	8.562	13.165	46.830	65.009	......	69.818	17.090	......	26.02
Waterproofing	Sq. Yds.	1,245.510	4,265.70	4,061.34	......	1,787.49	1,715.80	4,835	5,712	296.27	3,805.36	1,200.30	......	2,082.05
Water Pipes, 36-inch........	Lin. Ft.	......	169	......	......	......	......	755.40	208	......	......	......	......	......
Water Pipes, 12-inch........	"	......	......	6	......	......	170	......	164	......	......	33.90	......	......
Water Pipes, 8-inch........	"	23.3	......	......	......	......	......	......	......	......	......	......	......	......
Water Pipes, 6-inch........	"	......	33	22	......	......	70	......	......	......	......	......	......	......
Gas Pipes, 30-inch..........	"	......	35.40	......	......	......	......	......	......	......	......	......	......	......
Gas Pipes, 24-inch..........	"	......	......	16	......	......	......	......	......	......	......	......	......	......
Gas Pipes, 20-inch..........	"	......	......	......	......	22.90	363	......	......	......	......	......	......	......
Gas Pipes, 8-inch..........	"	......	8	34	......	17.16	300	......	212	......	......	......	......	......
Gas Pipes, 6-inch..........	"	32	59	62	......	......	778	......	......	......	......	......	......	......
Drain Pipes, 6-inch.........	"	......	......	......	......	......	......	......	......	......	......	......	......	......
Drain Pipes, 4-inch.........	"	......	......	......	48	......	......	138.70	281	......	......	......	......	......
Drain Pipes, 3-inch.........	"	......	......	......	......	168	......	......	152	......	......	......	......	......
Ducts laid (single).........	"	163,854	735,902	976,728	122,057	527,096	451,524	787,365	709,790	249,611	420,032	137,012	21,473	145,627
Telenhone, Telegraph and Electric Light Ducts..	"	84	......	23,522	......	......	......	......	......	......	......	......	......	......
Edison Ducts	"	......	......	396	......	......	......	......	......	......	......	......	......	......
Western Union Tubes......	"	150	......	......	......	......	......	......	......	......	......	......	......	......
Empire City Blow Pipes....	"	......	......	1,647.7	......	......	......	......	......	......	......	......	......	......
Track laid (single):														
Main Line	"	......	0.57	......	......	......	......	......	711	......	......	......	......	......
Sidings	"	......	542.45	378.94	......	......	......	789	......	......	75	75	......	......
Turnouts and Crossovers	"	......	186.16	......	......	......	......	......	......	......	......	......	......	......
Expended on Station........	Dollars.	......	......	......	......	......	......	......	......	......	......	......	......	......

NOTE: Sections marked * denote Final Quantities.

No. 1, BY EACH SUB-CONTRACTOR TO DECEMBER 31, 1906.

. 9-A. iver.)	*Sec. 9-B.	*Sec. 10.	*Sec. 11.	*Sec. 12.	Sec. 13.	Sec. 14.	Sec. 15.	*Lenox Avenue Extension.	Total Extra Work, 1901.	Total Extra Work, 1902.	Total Extra Work, 1903.	Total Extra Work, 1904.	Total Extra Work, 1905.	Total Extra Work, 1906.	Total to Date.
....	3,754.58	1,441.60	30,584.60	68.90	9,617	34	21	42,729.61	12,743	40,897	95,368	1,669	4,182.45	—915.42	153,944.03
....	6,848.03	3	36,765.40	6.70	1,625	103	1.14	1,952.53	9,446	38,865	38,107	2,800	—11,220.24	—446.83	77,550.93
....	......	......	......	......	5,046	7,022	......	......	......	2,133	1,998	3,408	6,502.7	—208	13,833.70
....	2,206.01	2,121.45	8,256.63	58.20	2,156	1,700	12.08	14,286.74	771	7,186	30,142	9,100	—194.01	87.09	47,092.08
....	......	......	623.12	60.50	105	......	......	......	491	619	69	......	—389.38	—1	788.62
6.927	95.41	4,558.92	1,269.778	560.685	191	......	1,335.793	715.194	19	1,372	4,362	4,289	—226.9571	231.203	10,046.2459
....	26.02	12.032	2.525	48.406	66	......	......	73.999	......	69	285	105	75.388	1.02	535.408
....	24.62	......	207.90	4.26	1,127	—5	......	73.76	5	100	1,030	546	879.65	—60.38	2,500.27
....	......	......	1.70	7.84	137	17	......	......	......	6	5	54	162.54	—64	163.54
....	......	5.50	86.89	......	14	......	......	......	17	75	27	25	—34.07	—4	105.93
....	......	......	8.60	21.50	9	......	......	......	1	5	34	1	—1.90	......	39.10
....	804.36	......	450.04	......	1,528	......	......	5,244.52	......	313	3,301	5,585	8,454.61	803.36	18,456.97
....	......	......	324.17	......	......	......	......	—40	......	......	......	......	375.59	......	375.59
....	......	149.93	7,185.47	......	......	......	......	......	......	......	2,562	2,325	2,448.40	......	7,335.40
....	......	......	223.17	......	......	......	......	468.36	......	107	352	1,097	—245.32	......	1,310.68
6.927	91.91	4,556.45	1,269	560.685	227	......	1,335.793	715.194	671	996	5,030	3,307	—99.6941	200.703	10,105.0089
....	26.02	12.032	48	......	66	......	......	73.999	......	129	257	50	34.643	1.02	471.663
....	2,082.05	......	16,942.33	......	3,862	......	......	17,938.01	2,563	14,562	41,296	10,476	907.110	—54.95	69,749.160
....	......	......	754.70	......	......	......	......	......	......	635	213	......	1,039.10	......	1,887.10
....	......	......	38.50	......	......	......	......	582.84	......	......	......	753	242.24	......	995.24
....	......	......	13	......	......	......	......	......	......	13	......	......	23.3	......	36.30
....	......	......	......	......	......	......	......	179.75	......	......	......	250	54.75	......	304.75
....	......	......	......	......	......	......	......	454.15	......	......	......	454	35.55	......	489.55
....	......	......	13	......	......	......	......	36.40	......	13	......	......	52.40	......	65.40
....	......	......	......	......	......	......	......	63.30	......	......	......	426	23.20	......	449.20
....	......	......	......	......	......	......	......	......	......	......	......	......	571.16	......	571.16
....	......	......	......	......	......	......	......	588.69	......	......	......	1,366	153.69	......	1,519.69
....	......	......	......	......	346.60	......	......	......	24	11	......	200	111.60	......	346.60
....	......	......	......	......	67.02	......	......	......	......	67	......	175	244.72	......	486.72
....	......	......	590	......	644	......	......	......	130	511	......	270	643	......	1,554
3	145,627	229,269	270,351	66,528	462,279	160,385	......	......	1,320,500	2,558,694	2,314,391	398,275	26,977	53,167	6,672.004*
....	......	......	......	......	......	......	......	......	......	......	......	......	23,606	......	23,606
....	......	......	......	......	......	......	......	......	......	......	......	......	396	......	396
....	......	......	......	......	......	......	......	......	......	......	......	......	150	......	150
....	......	......	......	......	......	......	......	......	......	......	......	......	1,647.7	......	1,647.7
....	......	16,961.97	5,627.93	2,174	827	261	4,457	2,514.46	......	......	12,000	26,500	—5,129.07	164	33,534.93
....	......	......	......	......	......	......	......	116.07	......	......	......	......	1,976.46	......	1,976.46
....	......	969.70	1,647.65	324	......	......	409	388.74	......	......	......	......	3,927.85	......	3,927.85
....	......	......	......	......	......	......	......	15,402	......	......	500	9,260	5,642	......	15,402

*Includes 1,054,537 lin. ft. Ducts laid in Street.

1906, inclusive. That designated "regular" is for work within the neat structural lines; while items specifically ordered by the Board come under the head of "extra" work.

Item.		Regular.	Extra.	Total.
Earth excavation	Cu. Yds.	1,947,483	153,944	2,101,427
Rock excavation	"	836,641	77,551	914,192
Tunneling	"	365,457	13,834	379,291
Concrete masonry	"	530,498	47,882	578,380
Brick masonry	"	28,628	2,500	31,128
Cut stone masonry	"	1,782	39	1,821
Steel erected	Tons	62,596	10,046	72,642
Cast-iron erected	"	3,897	535	4,432
Track laid	Lin. Ft.	297,213	33,535	330,748

The total amount of money expended, on account of both regular and extra work done to December 31, 1906, approved on vouchers, has been as follows:

	1900.	1901.	1902.	1903.
Regular work	$1,685,000	$10,343,000	$11,436,000	$6,930,000.00
Extra work	....	162,000	631,000	2,563,021.47
Total	$1,685,000	$10,505,000	$12,067,000	$9,493,021.47

	1904.	1905.	1906.	Total.
Regular work	$3,220,000.00	$869,000.00	....	$34,483,000.00
Extra work	932,304.61	4,950.00	$6,000.00	4,299,276.08
Total	$4,152,304.61	$873,950.00	$6,000.00	$38,782,276.08

Tables annexed give the quantities of regular and extra work under all heads, performed by each sub-contractor from the beginning of construction to December 31, 1906, inclusive.

CONTRACT NO. 2.

Work on Contract No. 2, the Brooklyn-Manhattan Railroad, was practically completed, in Manhattan, at the beginning of 1906. The only uncompleted work on Section No. 1, i. e., from Ann street to Bowling Green, consisted of restoring the surface of Battery Park. This work was begun at the end of March and was completed by the end of April.

The work of paving the surface of Broadway with wooden blocks by the Bureau of Highways was begun during the first week of April and completed by the end of May.

Progress on the other sections of this contract during 1906 consisted of the following:

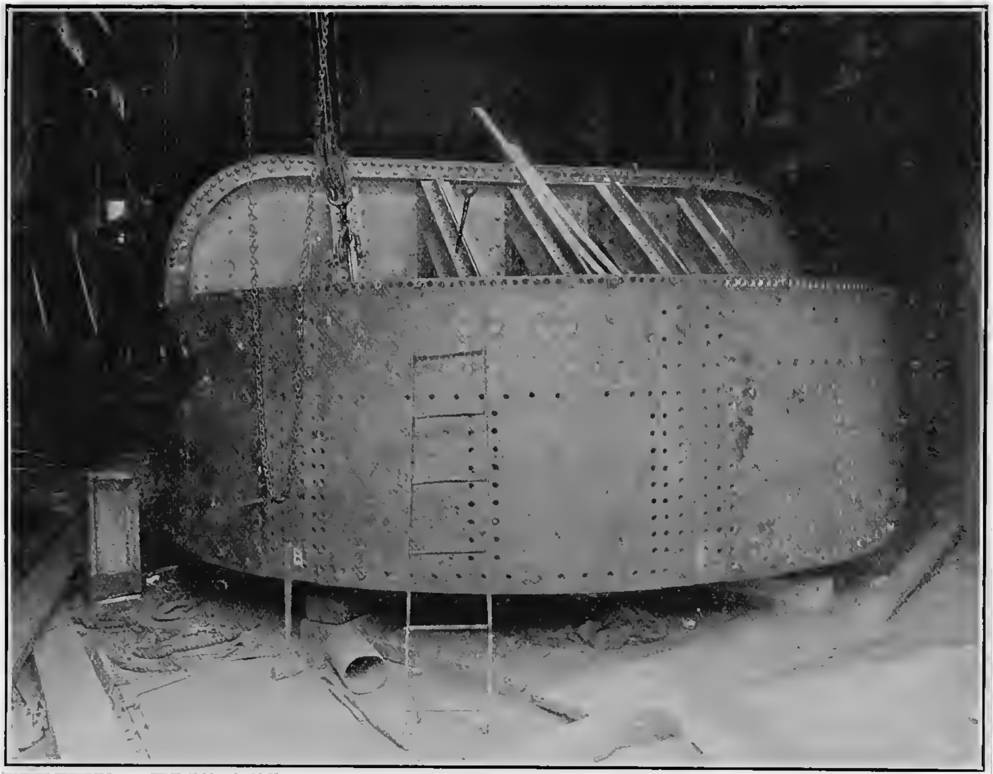
Section 2.—Battery Loop, Bowling Green to South Ferry.

This section, which comprises the two-track structure under Battery Park, was practically completed during the preceding year. It was opened for traffic on July 10, 1905, one year and eleven months after beginning the work. A certain amount of restoration work still remained, and during 1906 this has been in progress. The park grass plots and walks have been restored, except where occupied in connection with work on the river tunnel.

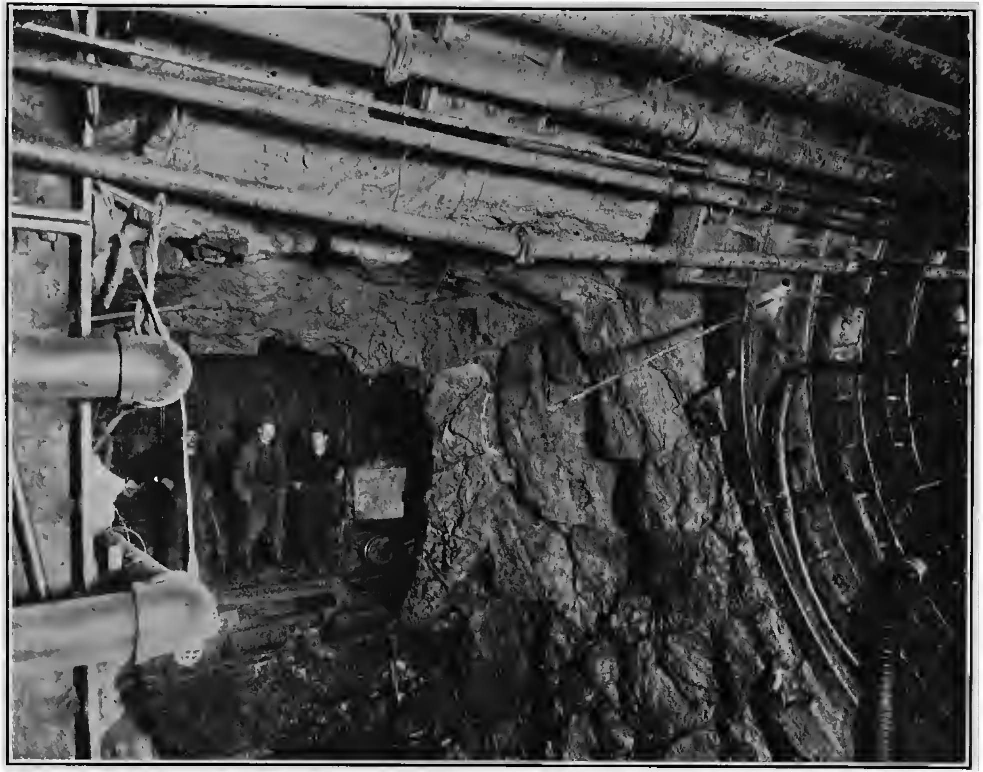
Section 2A.—South Ferry to Brooklyn, Joralemon street to Clinton street.

On this section the work on the tunnel under the East river is advancing rapidly to completion. The north tube is entirely driven through, while a distance of less than six hundred feet now separates the headings of the south tube.

Less satisfactory progress, however, was made driving the headings than appeared likely early in the year. This was due to several causes, chief among which may be mentioned the difficulties incident to working at greater depths under increasing air pressures, and the hindrance to the passage of the shields offered by the rock formation encountered on the Brooklyn side.



East River Tunnel Shield in Course of Construction in the Shops.



Excavation for Pump Between Tubes, East River Tunnel.

The Manhattan headings at the beginning of the year were continuing entirely in rock of good quality, permitting fairly rapid progress by ordinary tunneling methods without the use of shields. This condition lasted only a few weeks, however, and by March the cover of rock was lost from both headings. From that time on until late in the year the advance was rendered difficult and slow by the precautions which had to be taken to avoid inrushes of the overlying fine sand and clay while blasting the rock encountered in the bottom.

At the end of May it was considered advisable, in view of the above conditions and the disappointing progress in Brooklyn, to adopt the shield method for the Manhattan headings and continue them further than had been originally contemplated. Although the installation of shields was in itself a cause of delay, much time was eventually saved by decreasing the distance to be traversed by the Brooklyn shields.

Accordingly the following three months were occupied in excavating a chamber or working space well forward in each heading, setting up the shields and equipping them for the advance. This was a tedious operation, as each shield had to be made in small sections to pass the locks, and the riveting together of the several sections had to be done in compressed air.

By September the advance was resumed with both shields, the north one being carried a short distance ahead of the south. Late in October the north shield reached the end of the rock formation, which made it possible thereafter to more than quadruple the rate of progress which had prevailed since March. Meanwhile the opposite heading in Brooklyn had cleared the rock formation encountered in the preceding year, and was advancing at an equally rapid rate. On December 13, when the two shields were about sixty-five feet of each other, a six-inch iron pipe was driven through the intervening material, which established communication for the purpose of checking the lines and grades as laid down by the engineering corps of the Board. These were compared and found to agree within a margin of error so small as to be entirely negligible. The actual meeting of the headings took place on December 14, and at the end of the year their interior and fittings are being removed preparatory to making the final closure in the cast-iron lining (see Frontispiece).

The shields of the south tube followed those of the north throughout the year. On the Brooklyn side the nine months between March and December were required to pass through the rock formation that had delayed the progress of the north tube. At the end of the year the shields of both sides appear to have cleared the rock, and from now until they meet rapid progress is expected.

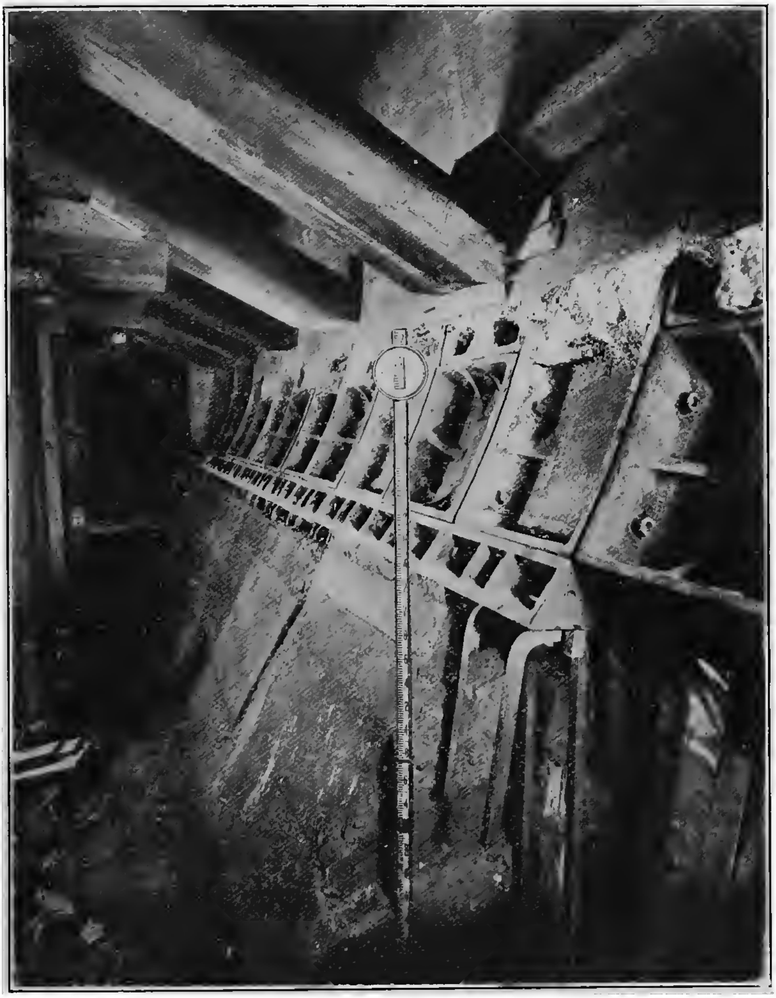
The progress made by the river headings in 1906 and previously is summarized as follows:

Location.	During 1906.	During 1903-4-5.	Total to Date.
Manhattan, North Heading	612 feet	2,298 feet	2,910 feet
Manhattan, South Heading	457 "	2,264 "	2,721 "
Brooklyn, North Heading	704 "	3,158 "	3,862 "
Brooklyn, South Heading	865 "	2,633 "	3,498 "
Totals	2,638 feet	10,353 feet	12,991 feet

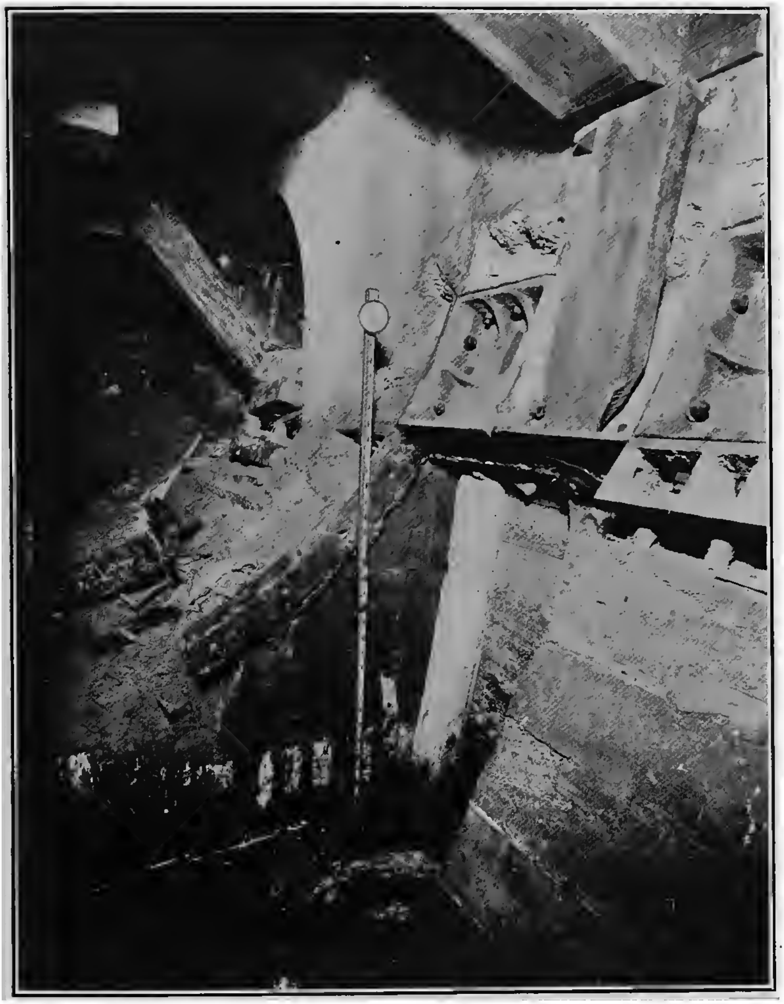
There remains to be tunneled a length of 566 feet in the south tube, out of a total length in both tubes of 13,557 feet, or 4 per cent.

In Battery Park a section of reinforced concrete subway about 500 feet long has been finished during the year to connect the river tunnel with the structure already in operation under Broadway. The excavation was by open cut, and as the bottom was in places as much as twenty-five feet below tide-level, some difficulty was experienced with water seeping in; but this was easily controlled by pumping. The structure is everywhere below ground water level and is effectively waterproofed with a complete envelope of brick laid in asphalt.

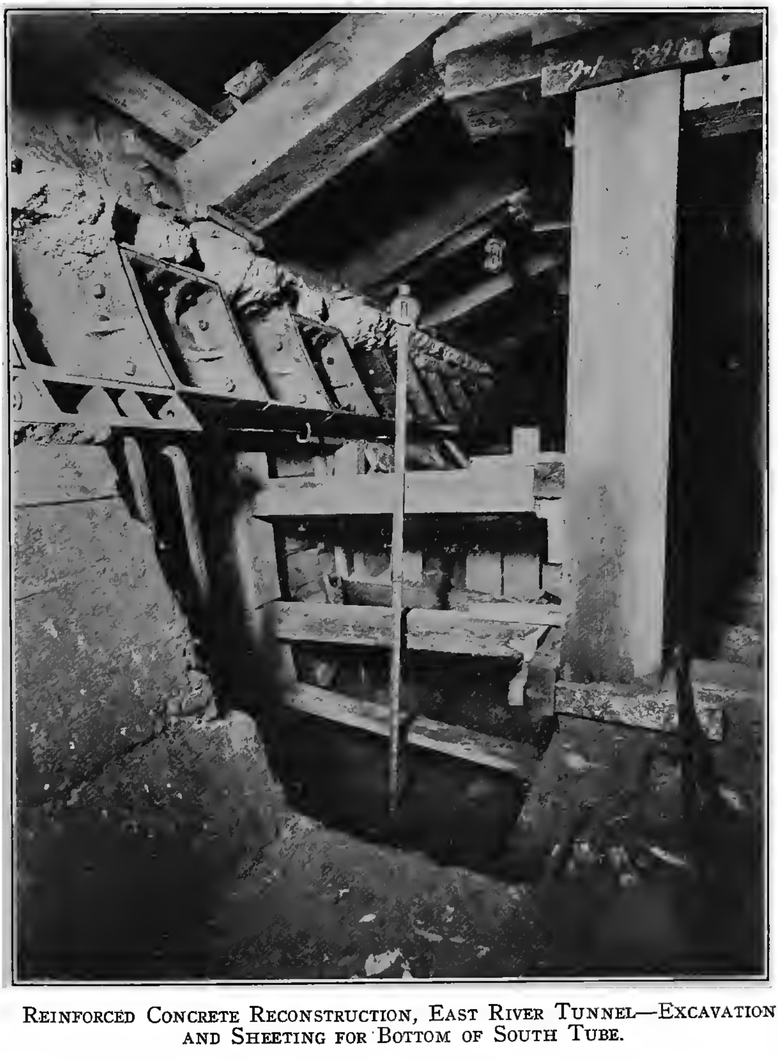
The work of correcting the deviations of the Brooklyn tubes has been proceeding since April and favorable progress has been



Reinforced Concrete Reconstruction, East River Tunnel—Finished Section, Bottom of South Tube.



Reinforced Concrete Reconstruction, East River Tunnel, South Tube —Old Lining Partly Removed, Preparatory to Excavation.



Reinforced Concrete Reconstruction, East River Tunnel—Excavation and Sheeting for Bottom of South Tube.

made. This has been done principally by Cranford & McNamee, the sub-contractors for the adjoining section in Brooklyn, under arrangement with the Rapid Transit Subway Construction Company. In view of the success obtained by the former parties, the New York Tunnel Company has recently undertaken some of the work on its own account, with equally good results. Out of a total length of 2,700 feet to be so reconstructed, about 1,700 feet, or nearly two-thirds of the work, have been finished.

The trouble experienced in the past from an insufficient supply of air has been largely remedied by successive additions to the compressor plant. To provide the increased air supply required for the reconstruction of the tubes in Brooklyn, three compressors were added to the plant at the foot of Joralemon street. The capacity of the plant in Battery Park was increased 70 per cent. by the addition of a new large compressor. The pressure of air maintained in the headings varied between 20 and 40 pounds.

Two serious "blow-outs" occurred during the year; one in June in the Brooklyn south heading, and the other in September in the Manhattan north heading. In each instance the sudden loss of pressure caused an inrush of water, mud and sand that drove out the workmen and filled the working chamber in a few minutes. Following the usual method in such cases, several thousand yards of clay were deposited on the bed of the river to fill up the hole and make the material more watertight. The resulting delay to the work amounted to about a month.

Section 3.—Clinton street, Fulton street, and Flatbush avenue to Atlantic avenue.

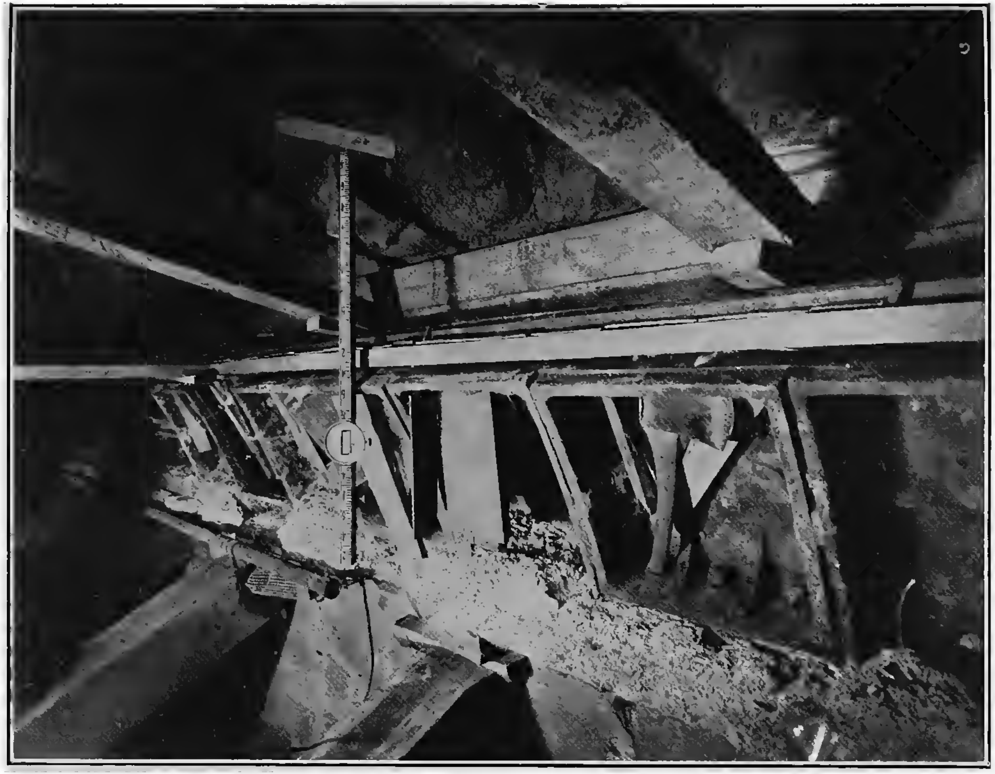
At the beginning of the year work on this section had been in progress for one year and nine months. As the addition of two tracks and spurs for future connections had only recently been decided on, nearly all of the work done up to this time had been on the basis of the original plans, and it was only during the last three months of 1905 that the enlargement of the structure could be proceeded with. Delays in deliveries of steel, caused by the general demand for the material throughout the country, and difficulty in securing it of the proper quality, amounted in many cases to several months. Without the steel no progress was possible, and this fact continued to hamper the work in the early part of 1906, and to some extent during the remainder of the year. The last order of steel, that for the Nevins street station, was placed in April, and of this order only 14 per cent. had been received.

In Joralemon street, where the structure is practically finished, the two brick tubes were connected in April to the river section, beginning near Clinton street. As on the adjoining section, tunneling methods were employed and resulted in some settlement at the surface. The damage done to the stoops of houses was repaired, and the sidewalks and pavement were relaid by arrangement with the local Highways Bureau.

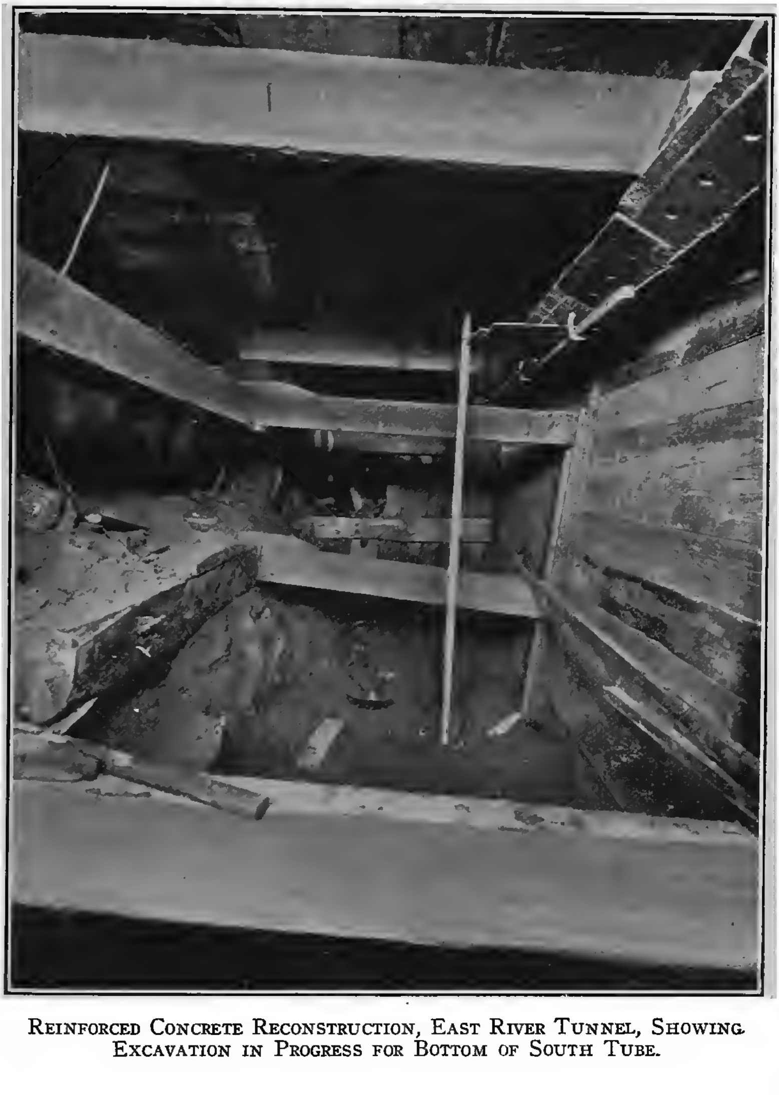
The main portion of the Borough Hall station is completed and the interior decorations are being placed. In connection with building the north side platform it has been necessary to underpin the Borough Hall building, and this is now in progress. Provision is made for ventilating the station through gratings in the sidewalk, as was done in the Manhattan stations.

In Fulton street rapid progress was made during the year. The first shipments of additional steel were for this portion, enabling the work to be prosecuted with more speed here than elsewhere. As fast as the steel arrived it was brought to the ground and set in position, and by the end of the year all that remains to be built is at the turns into Joralemon street and Flatbush avenue, and the wings of the Hoyt street station. Progress was made also in restoring vaults and sidewalks and replacing the pavement, and by the Christmas shopping season the street from Red Hook Lane to within a short distance of Hanover place was generally free from evidence of subway work.

At the Hoyt street station the central portion of the tracks was completed except for a short distance on the north side east of Bridge street. In this case the work was delayed somewhat by the failure of the owners of a large department store building to remove their boilers and other property from the vault under the sidewalk after a year's notice had been given that the space would be required for rapid transit purposes. In pursuance of agree-



Reinforced Concrete Reconstruction, East River Tunnel, South Tube—Special Segments in Place and Excavation in Progress.



Reinforced Concrete Reconstruction, East River Tunnel, Showing Excavation in Progress for Bottom of South Tube.

ments made with the owners of corner property, the station entrances on Bridge street and on the westerly side of Hoyt street are to be situated partly inside the building lines to avoid too great an encroachment on the sidewalk. The alterations in the buildings necessitated by this design were made by the owners and are to be paid for by the city.

Between Bond street and Flatbush avenue the depressed track passes close to the buildings on the south side, making it necessary to underpin their piers and extend them to a lower level to avoid subsequent settlement. In some instances the excavation for this purpose is below the level of ground water; but such have been the precautions taken that here, as well as in the equally difficult task of supporting the elevated railway structure, no accidents have occurred.

In Flatbush avenue the steel for the new work began to arrive in January, but not in sufficient quantity to warrant resuming construction actively until May. In the meantime progress was made in widening the excavation for the extra tracks, and in underpinning the piers of buildings adjoining the Nevins street station and the depressed tracks. At the end of the year, although the last order of additional steel for this section was placed early in April, but little more than half of it has been delivered, making the progress of the work correspondingly slow.

The most difficult work on the section occurs in building the depressed track between the Manhattan bridge spur and the Lafayette avenue spur. For this it is necessary to underpin and support the three-track subway built here in 1904 while excavating for the lower track alongside and crossing under it. Some settlement to the old structure has resulted, but it is not of a serious nature.

At the Nevins street station further progress is stopped until deliveries of steel can be had. For this reason, and to reduce the general inconvenience in a busy locality, the Contractor was directed to plank over the excavation temporarily, leaving only such openings as are needed to prevent the accumulation of gas from street mains.

The steel for the Atlantic avenue station is only beginning to arrive, on which account it has not been possible to start construction earlier at that point.

The methods in use for excavating and disposing of material, and temporarily supporting the elevated structure over the cut, remain the same as described last year.

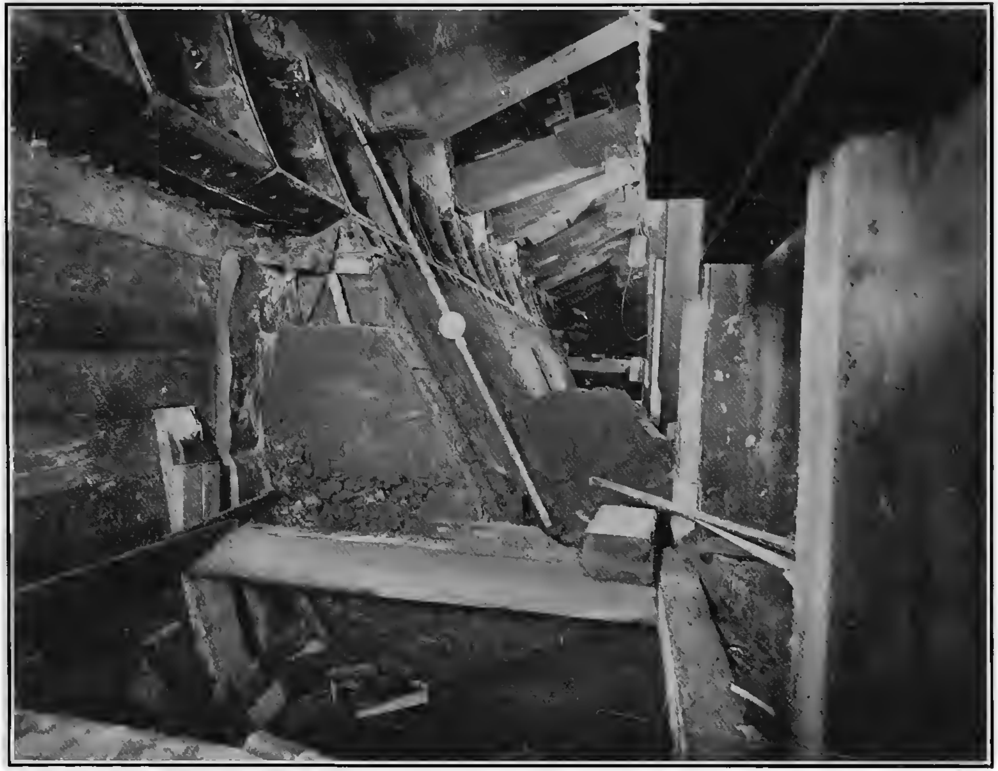
At the close of the year the excavation done on the whole section amounts to 80 per cent. of the total; and about 60 per cent. of the concrete, which is a measure of the construction progress, is finished. Most of the work remaining to be done is in Flatbush avenue.

There were very few casualties during the year, and but one accidental death—the first that has occurred on the section. The record in this respect is remarkable and reflects great credit on the conduct of the work by the sub-contractors.

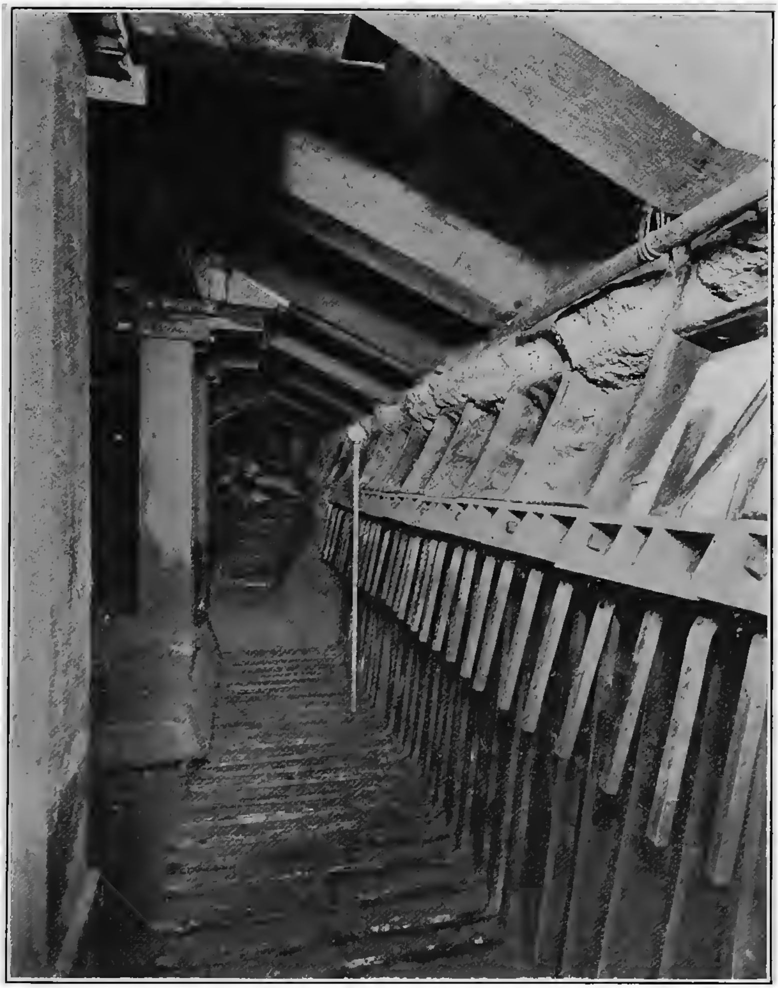
The chief items for both regular and extra work on each section of Contract No. 2, for which the Contractor has been paid from the beginning of construction to December 31, 1906, are given in the following table:

Item.	Regular Work.			Extra Work.		Totals.
	Previously Reported.	Done During 1905.	Done During 1906.	Done During 1905.	Done During 1906.	Regular and Extra Work.
Earth excavation, cu. yds..	214,588	114,792	67,271	14,664	80,302	491,617
Rock excavation, "	4,047	843	548	....	....	5,438
Tunneling, "	54,800	36,030	24,133	....	....	114,963
Concrete masonry, "	35,237	20,724	17,509	869	9,591	83,930
Brick masonry, "	1,881	1,112	1,982	....	338	5,313
Steel erected, tons........	3,269	1,948	1,858	71	877	8,023
Cast-iron erected, tons.....	9,591	10,577	5,099	....	....	25,267

These totals added to the totals given in similar table hereinbefore submitted for Contract No. 1 give the total amount of such work done by the Board to date.



Reinforced Concrete Reconstruction, East River Tunnel, Showing Sheeting, Sheet-Lead Waterproofing, and Completed Section of Bottom of South Tube.



Reinforced Concrete Reconstruction, East River Tunnel, South Tube, Showing Method of Reinforcement and Connecting Shoe Plates.

The total estimates made for all work done on Contract No. 2 to and including December 31, 1906, for which the Contractor has received payment, are as follows:

Year 1903—Regular work	$202,457.06
Year 1904—Regular work	620,425.62
Year 1905—Regular work	491,504.53
Year 1905—Extra work	82,895.00
Year 1906—Regular work	314,718.97
Year 1906—Extra work	457,081.87
Total	$2,169,083.05

The total value of all work done by the Board to date, comprising both Contract No. 1 and Contract No. 2, is as follows:

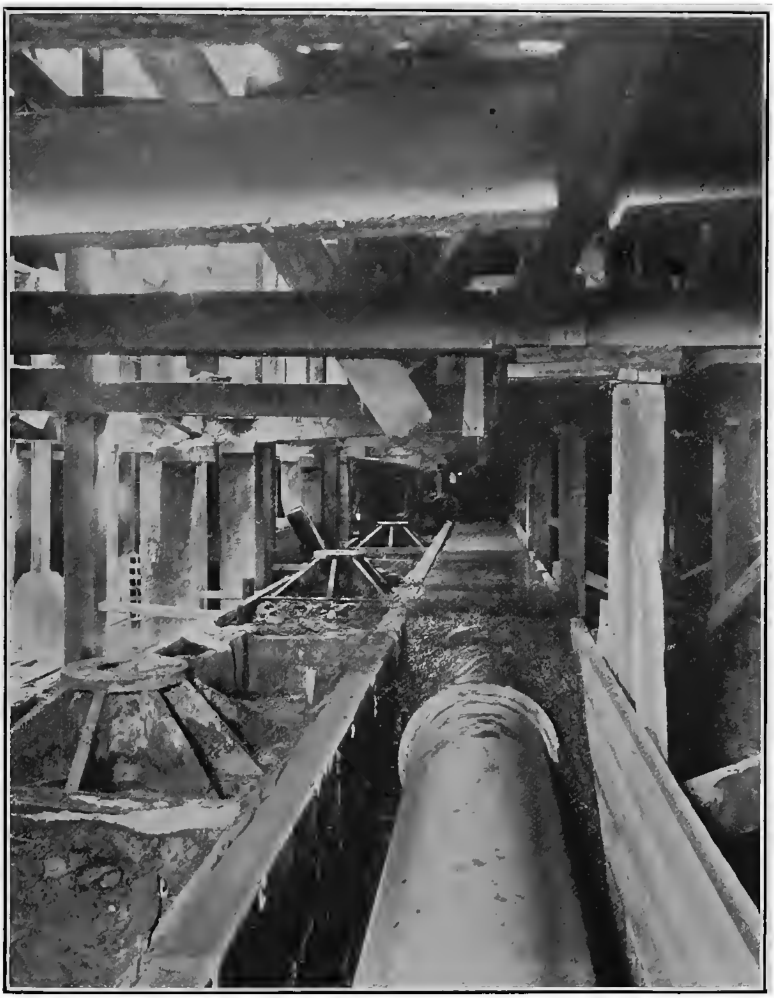
Contract No. 1, regular	$34,483,000
Contract No. 1, extra	4,299,276
Contract No. 2, regular	1,629,106
Contract No. 2, extra	539,976
Total	$40,951,358

The following tables give the quantities of Regular and Extra work under all heads, as performed by each sub-contractor from the beginning of construction to December 31, 1906:

TOTAL AMOUNT OF CONTRACT WORK DONE, ON CONTRACT NO. 2, BY EACH SUB-CONTRACTOR TO DECEMBER 31, 1906.

Item.	Quantity.	* Sec. 1.	Sec. 2. Battery Park Loop.	Sec. 2-A. East River Tunnel.	Sec. 3.	Work Done to Dec. 31. 1904.	Work Done During 1905.	Work Done During 1906.	Total to Date.
Earth excavation	Cu. Yds.	120,290.45	60,889.70	17,651	197,820	214,588	114,792.45	67,270.70	396,651.15
Rock excavation	"	759.60	2,988	1,690	......	4,047	842.60	548	5,437.60
Tunneling	"	......	......	114,963	......	54,800	36,030	24,133	114,963
Portland Cement concrete	.	20,812.20	19,233	4,641	28,784	35,237	20,724.20	17,509	73,470.20
Steel erected	Tons	2,162.44	1,229.60	816	2,867	3,269	1,948	1,858.04	7,075.04
Cast iron erected	"	210.868	33.31	24,920	103	9,591	10,577	5,099.178	25,267.178
Brick masonry (common)	Cu. Yds.	1,615.42	......	......	3,360	1,881	1,112.42	1,982	4,975.42
Restoring street surface and repaving	Sq. Yds.	12,753.11	3,658	......	6,532	......	16,330.11	6,613	22,943.11
Restoring park surface	"	1,207.45	2,072	611	......	......	1,798	2,092.45	3,890.45
Vault lights	"	1,503.97	212	......	341	......	1,715.97	341	2,056.97
Steel delivered	Tons	2,162.44	1,229.60	852	3,801	......	6,297	1,748.04	8,045.04
Cast iron delivered	"	210.868	33.31	27,874	169	......	24,618	3,669.178	28,287.178
Sump and pump	No.	......	1	......	......	......	1	......	1
Waterproofing	Sq. Yds.	39,223.50	24,691	5,153	25,027	......	78,549.50	15,545	94,094.50
Brick in asphalt	"	8,433.07	17,770	5,053	12,702	......	35,336.07	8,622	43,958.07
Concrete above waterproofing	Cu. Yds.	......	919.40	183	33	......	951	184.40	1,135.40
Grouting	"	......	......	1,125	......	......	798	327	1,125
Beton	"	......	......	3,627	......	......	2,481	1,146	3,627
Ducts laid, single	Lin. Ft.	178,612.76	33,217	46,930	187,344	......	338,026.76	108,077	446,103.76
Empire City ducts	"	32,505	......	......	......	......	32,505	......	32,505
Edison ducts	"	16,155	......	......	......	......	15,659	496	16,155
Western Union tubes	"	2,811	......	......	......	......	3,196	—285	2,911
Expended on stations	Dollars	106,070.31	16,494.09	......	......	......	92,829	29,735.40	122,564.40
Track laid (single):									
Main line	Lin. Ft.	6,730.90	......	......	......	......	6,730.90	......	6,730.90
Turnouts and cross-overs	"	230	......	......	......	......	230	......	230
Water pipes, 24-inch	"	......	......	......	3,480	......	3,480	......	3,480
Water pipes, 20-inch	"	2,541.50	......	......	......	......	2,794	—252.50	2,541.50
Water pipes, 16-inch	"	157.70	......	......	......	......	157.70	......	157.70
Water pipes, 12-inch	"	2,266.90	......	......	406	......	2,534	138.90	2,672.90
Water pipes, 10-inch	"	87.50	......	......	......	......	87.50	......	87.50
Water pipes, 6-inch	"	869	......	......	......	......	869	......	869
Gas pipes, 24-inch	"	2,265	......	......	......	......	2,314	—49	2,265
Gas pipes, 20-inch	"	260	......	......	185	......	445	......	445
Gas pipes, 16-inch	"	1,490.40	......	......	...	......	1,459	31.40	1,490.40
Gas pipes, 12-inch	"	2,325	......	......	130	......	2,204	260	2,464
Gas pipes, 10-inch	"	118.50	......	......	5	......	123.50	......	123.50
Gas pipes, 8-inch	"	109	......	......	121	......	230	......	230
Gas pipes, 6-inch	"	2,029.30	......	......	95	......	2,117	7.30	2,124.30
Gas pipes, 4-inch	"	148	......	......	......	......	148	......	148
Drain pipes, 8-inch	"	......	1,119	......	......	......	1,077	42	1,119
Drain pipes, 6-inch	"	1,204.63	910	436	......	......	1,903	647.63	2,550.63
Drain pipes, 4-inch	"	162.25	......	......	......	......	130	32.25	162.25
Drain pipes, 3-inch	"	395.32	......	......	......	......	374	21.32	395.32
Steam pipes, 15-inch	"	315.20	......	......	......	......	315.20	......	315.20
Steam pipes, 10-inch	"	416.60	......	......	......	......	416.60	......	416.60

Section 1, marked *, indicates Final Quantities,



Sewer Construction Under Platform at Hoyt Street Station, Brooklyn.

TOTAL EXTRA WORK ON SECTION 3, CONTRACT NO. 2, DUE TO FOURTH TRACK AND CONNECTIONS.

Item.	Quantity.	Work Done During 1905.	Work Done During 1906.	Total Extra Work to Date.
Earth excavation	Cu. Yds.	14,664	80,302	94,966
Portland cement concrete..	"	869	9,591	10,460
Steel erected	Tons	71	877	948
Steel delivered	"	290	2,138	2,428
Brick masonry (common)..	Cu. Yds.	....	338	338
Restoring street surface....	Sq. Yds.	....	858	858
Waterproofing	"	....	8,479	8,479
Brick in asphalt...........	"	....	5,981	5,981
Ducts laid (single)........	Lin. Ft.	....	31,604	31,604

WORK OF SEWER DIVISION.

Sewer work on Contract No. 1 was reported completed in the last annual report. On account of the location of the waiting room at St. Nicholas avenue (Broadway) and One Hundred and Eighty-first street, cutting out a portion of the existing sewer, it became necessary to reconstruct 31.8 feet of 15-inch vitrified pipe sewer and 52.2 feet of 3′ 6″ x 2′ 4″ brick sewer during the year 1906.

The lateral sewer in Fleet street and Lafayette street and the one in Livingston street and Nevins street, Brooklyn, mentioned in the last annual report, necessitated by the modification of the plans for four-tracking Fulton street and Flatbush avenue, have been completed, and the plumbing in the triangular block bounded by Flatbush avenue, Nevins street and Livingston street has been changed from Flatbush avenue and connected to the new sewer in Livingston street.

Plans have been prepared for the relocation of the 15-foot storm water sewer crossing under the Atlantic avenue station from Hanson place to Fourth avenue, Brooklyn. To have disposed of this sewer in order to accommodate any or all of the subways in the vicinity of this station would have required its removal to Fifth avenue and possibly to Sixth avenue, which would have involved an expense entirely too great in view of the uncertainty as to which routes will be built. It was, therefore, decided to relocate it outside of the east wall of the spur track on the second level which is being built under the modified plan of the present subway for a connection with a possible future subway in Fourth avenue. If this connection is ever made, the portion of the sewer under the Atlantic avenue station will be permanent, but a new connection will have to be made with the present sewer at some point farther south on Fourth avenue, where a crossing can be made under the subway.

If an independent subway is built from Ashland place crossing under the present subway in Flatbush avenue into Fourth avenue, the sewer will have to be entirely removed.

Since the adoption of this plan, the engineers of the Sewer Bureau have made some studies with the object of relieving this storm sewer and possibly diverting it entirely. It will thus be possible to do entirely away with it at this point and build a new outlet to the East river, in case it should be decided to build a subway crossing under the present subway at Flatbush avenue.

All sewer reconstruction in connection with the new ventilating chambers on Contract No. 1 has been completed during the past year.

The following tables show the amount of sewer work done during the year and to date; also the amount of work done which will have to be removed and the amount of work remaining to be done, both on the original and on the modified contract; also the amount of work done in connection with the construction of ventilating chambers on Contract No. 1:

DETAILS OF LATERAL SEWERS TO DECEMBER 31, 1906—CONTRACT NO. 2.

Location.	Sub-Contractor.	Date Begun.	Size.	Lin. Feet Completed During 1906.	Total Lin. Ft. Completed to Dec. 31, 1906. Permanent. Original Contract.	Permanent. Modified Contract.	Built and Abandoned. Removed.	Built and Abandoned. To Be Removed.	To Be Completed. Original Contract.	To Be Completed. Modified Contract.	Lin. Feet Original Contract Not Built To Be Abandoned.	Old Sewer Removed. Lin. Feet.	Old Sewer Removed. Size.
Fulton Street, Manhattan	Jas. Pilkington	Apr. 21, 1903.	3' 6" x 2' 4" Brick	....	314	....	....	....	....	....	....	5	2' 6" x 2' 4" Brick
Maiden Lane, Manhattan	Jas. Pilkington	Mar. 2, 1903.	3' 6" x 2' 4" Brick	....	332	....	....	....	....	....	....	332	4' 5" x 5' 5" Brick
			3' 0" x 2' 0" Brick	....	10	....	....	....	....	....	....	10	3' 0" x 2' 0" Brick
				....	342	....	....	....	....	....	....	342	
State Street, Manhattan	Jas. Pilkington	Nov. 8, 1902.	4' 0" x 3' 0" Brick	....	336	....	....	....	....	....	....	250	4' 0" x 3' 6" Brick
Court Street, at Joralemon Street, Brooklyn.	Cranford & McNamee.	July 10, 1906.	3' 6" x 2' 4" Brick	100	100	....	....	....	5	....	....	115	24" x 18" Brick
			20" C. I. Pipe	12	12	....	....	....	....	....	....	....	
			18" C. I. Pipe	12	12	....	....	....	....	....	....	....	
				124	124	....	....	....	5	....	....	115	
Joralemon Street, at Borough Hall, Brooklyn.	Cranford & McNamee.	Mar. 21, 1903.	12" Vit. Pipe	23	153	....	....	....	160	....	....	75	12" Vit. Pipe
Lafayette and Fleet Streets, Brooklyn	Cranford & McNamee.	Oct. 9, 1905.	3' 6" x 2' 4" Brick	520	....	950	....	....	....	23	....	836	12' Vit. Pipe
			24" C. I. Pipe	40	....	40	....	....	....	20	....	....	
				560	....	990	....	....	....	43	....	836	
Hudson Avenue, Brooklyn	Cranford & McNamee.	Mar. 30, 1903.	4' 6" x 3' 0" Brick	....	2,322	....	....	....	....	85	....	480	3' 6" x 2' 4" Brick
			36" C. I. Pipe	....	....	....	....	....	....	83	....	745	15" Vit. Pipe
			42" C. I. Pipe	....	....	....	....	24	....	....	50	....	12" Vit. Pipe
			4' 6" x 1' 4" Steel Box	....	....	....	....	....	....	30	....	966	
			15" Vit. Pipe	....	30	....	....	....	....	....	....	....	
				....	2,352	....	....	24	....	198	50	2,191	
Nevins and Livingston Streets, Brooklyn	Cranford & McNamee.	Mar. 6, 1906.	3' 6" x 2' 4" Brick	252	....	252	....	....	....	3	....	282	12" Vit. Pipe
			18" Vit. Pipe	359	....	359	....	....	....	6	....	28	15" Vit. Pipe
				....	....	....	....	....	....	....	....	247	3' 0" x 2' 0" Brick
				611	....	611	....	....	....	9	....	557	
Flatbush Avenue, at Fourth Avenue, Brooklyn.	Cranford & McNamee.	Oct. 18, 1906.	15' 0" Cir. Brick	....	....	....	....	....	....	292	....	....	
Ashland Place, Brooklyn	Cranford & McNamee.	Not begun	6' 0" Cir. Brick	....	....	....	....	....	1,072	....	1,072	....	
			6' 0" x 4' 0" Brick	....	....	....	....	....	255	....	255	....	
			60" C. I. Pipe	....	....	....	....	....	12	....	12	....	
			36" C. I. Pipe	....	....	....	....	....	420	....	420	....	
			18" Vit. Pipe	....	....	....	....	....	20	....	20	....	
				....	....	....	....	....	1,779	....	1,779	....	
Grand Totals				1,318	3,621	1,601	....	24	1,944	533	1,829	4,371	

DETAILS OF LONGITUDINAL SEWERS TO DECEMBER 31, 1906—CONTRACT NO. 2.

Location.	Sub-Contractor.	Date Begun.	Size.	Lin. Feet Completed During 1906.	Total Lin. Ft. Completed to Dec. 31, 1906. Permanent.		Built and Abandoned.		To Be Completed.		Lin. Feet Original Contract Not Built To Be Abandoned.	Old Sewer Removed.	
					Original Contract.	Modified Contract.	Removed.	To Be Removed.	Original Contract.	Modified Contract.		Lin. Feet.	Size.
Broadway—City Hall to Battery Place, Manhattan.	Degnon Contracting Company	Feb. 8, 1904.	18" C. I. Pipe	....	206	....	....	....	....	....	....	370	4' 0" x 3' 0" Brick
			3' 0" x 2' 0" Brick	....	30	....	....	....	....	....	....	190	3' 8" x 3' 4" Brick
			3' 0" x 2' 4" Concrete	....	277	....	....	....	....	....	....	235	3' 7" x 3' 6" Brick
			3' 0" x 2' 4" Brick and Concrete	....	70	....	....	....	....	....	....	100	3' 6" x 2' 4" Brick
			3' 6" x 2' 4" Brick	....	1,092	....	....	....	....	....	....	250	3' 0" x 2' 0" Brick
			4' 0" Cir. Brick	....	6	....	....	....	....	....	....	....	
				....	1,681	....	....	....	....	....	....	1,145	
Fulton Street—Borough Hall to Flatbush Avenue, Brooklyn	Cranford & McNamee.	Dec. 5, 1904.	12" Vit. Pipe	1,320	1,035	325	....	....	1,001	276	....	35	3' 6" x 2' 8" Brick
			15" Vit. Pipe	46	196	....	....	....	....	....	222	1,068	2' 8" x 2' 3" Brick
			18" Vit. Pipe	640	279	361	1,396	....	....	140	601	701	15" Vit. Pipe
			24" Vit. Pipe	....	....	....	....	....	60	....	....	2,532	12" Vit. Pipe
			8" C. I. Pipe	95	....	95	....	....	....	85	....	....	
			12" C. I. Pipe	15	15	....	....	....	83	....	....	....	
			18" C. I. Pipe	724	724	....	12	....	103	....	....	....	
			24" C. I. Pipe	....	....	....	....	....	120	....	....	....	
			3' 6" x 2' 4" Brick	128	128	....	....	....	108	....	....	....	
				2,968	2,377	781	1,408	....	1,475	501	823	4,336	
Flatbush Avenue—Fulton Street to Atlantic Avenue, Brooklyn	Cranford & McNamee.	June 29, 1904.	12" Vit. Pipe	370	245	198	437	132	486	278	....	1,875	12" Vit. Pipe
			15" Vit. Pipe	45	25	20	128	....	125	117	....	320	15" Vit. Pipe
			18" Vit. Pipe	....	....	....	316	....	....	286	....	782	18" Vit. Pipe
			14" C. I. Pipe	....	....	....	....	....	270	70	....	50	4' 0" x 3' 0" Brick
			18" C. I. Pipe	....	....	....	12	....	....	....	148	....	
			4' 9" x 3' 2" Brick	....	....	....	....	....	....	20	....	....	
				415	270	218	893	132	881	771	148	3,027	
Grand Totals				3,383	4,328	999	2,301	132	2,356	1,272	971	8,508	

DETAILS OF SEWERS ALONG VENTILATING CHAMBERS TO DEC. 31, 1906—CONTRACT NO. 1.

Location.	Contractor.	Date Begun.	Size.	Lin. Feet Completed.	Old Sewer Removed.	
					Lin. Feet.	Size.
Lafayette street, east side, Manhattan, southeast corner Grand street	Degnon Contracting Company	July 28, 1906	16" C. I. Pipe	110	32	18" Vit. Pipe
			3' 6" x 2' 4" Brick	14	102	15" Vit. Pipe
			3' 3" x 3' 0" Brick	15	...	
				139	134	
Lafayette street, east side, Manhattan, between Prince and Jersey streets	Degnon Contracting Company	June 30, 1906	20" C. I. Pipe	88	107	18" Vit. Pipe
			4' 8" x 3' 0" Brick	34	...	
				122	107	
Lafayette street, east side, Manhattan, southeast corner Fourth street	Degnon Contracting Company	June 30, 1906	20" C. I. Pipe	27	31	18" Vit. Pipe
			18" Vit. Pipe	4	...	
				31	31	
Fourth avenue, east side, Manhattan, southeast corner Eleventh street	Degnon Contracting Company	June 30, 1906	16" C. I. Pipe	76	88	15" Vit. Pipe
			3' 6" x 2' 4" Brick	16	...	
				92	88	
Fourth avenue, east side, Manhattan, northeast corner Twentieth street	Degnon Contracting Company	July 7, 1906	16" C. I. Pipe	60	68	15" Vit. Pipe
			5' 3" x 3' 0" Brick	13	...	
				73	68	
Fourth avenue, west side, Manhattan, between Twenty-fifth and Twenty-sixth streets	Degnon Contracting Company	June 30, 1906	16" C. I. Pipe	90	92	15" Vit. Pipe
			15" Vit. Pipe	2	...	
				92	92	
Fourth avenue, west side, between Thirtieth and Thirty-first streets, Manhattan	Degnon Contracting Company	June 30, 1906	16" C. I. Pipe	104	104	15" Vit. Pipe
Forty-second street, south side, at Bryant Park, Manhattan	Degnon Contracting Company	Sept. 8, 1906	3' 0" x 2' 0" Brick	14	...	
Broadway, west side, Manhattan, between Fifty-fifth and Fifty-sixth streets	Degnon Contracting Company	July 14, 1906	15" Vit. Pipe	21	153	15" Vit. Pipe
			16" C. I. Pipe	127	...	
			3' 6" x 2' 4" Brick	25	...	
				173	153	
Grand totals				840	778	

COMPLETION OF STATIONS.

Altogether forty-two permanent stations and one temporary station on Contract No. 1 had been completed and opened to the public at the beginning of the year. Thirty-five of these were underground, seven were on the elevated structure, and one was a temporary elevated station at One Hundred and Eightieth street and Boston road. This latter station is to be used until the permanent station at Bronx Park is constructed.

During the year the two tunnel stations at One Hundred and Sixty-eighth and One Hundred and Eighty-first streets, the elevated stations at Dyckman and Two Hundred and Fifteenth streets, and the temporary station at Two Hundred and Twenty-first street have been opened to the public. The Two Hundred and Seventh street elevated station has been completed, but not opened for operation. The Kingsbridge (225th street) elevated station is under construction. No construction has been begun upon the Two Hundred and Thirty-first street, Two Hundred and Thirty-eighth street, and Van Cortlandt Park elevated stations on the Broadway branch, or upon the Bronx Park station on the West Farms branch.

The One Hundred and Sixty-eighth and One Hundred and Eighty-first street stations are located in the deepest portions of the railroad. The station platforms are 98 and 122 feet below the surface, respectively. Passengers have access to the stations by means of elevators.

On Contract No. 2 there are eight underground stations; four of these are located in Manhattan, and four in Brooklyn. The former, the Fulton street, Wall street, Bowling Green and South Ferry stations, were completed and opened for operation during 1905; the latter, the Borough Hall, Hoyt street, Nevins street and Atlantic avenue stations, have not been completed. The Borough Hall station is under construction and is about one-third finished.

VENTILATION.

The subway was opened for operation on October 27, 1904. In the early spring of the following year passengers riding in the subway were sensible of objectionable odors, and the air became very warm. Complaints of the poor ventilation of the subway were numerous. In consequence of these conditions, investigations were instituted under the direction of the Board with a view to determining the causes of the conditions and providing remedies for them.

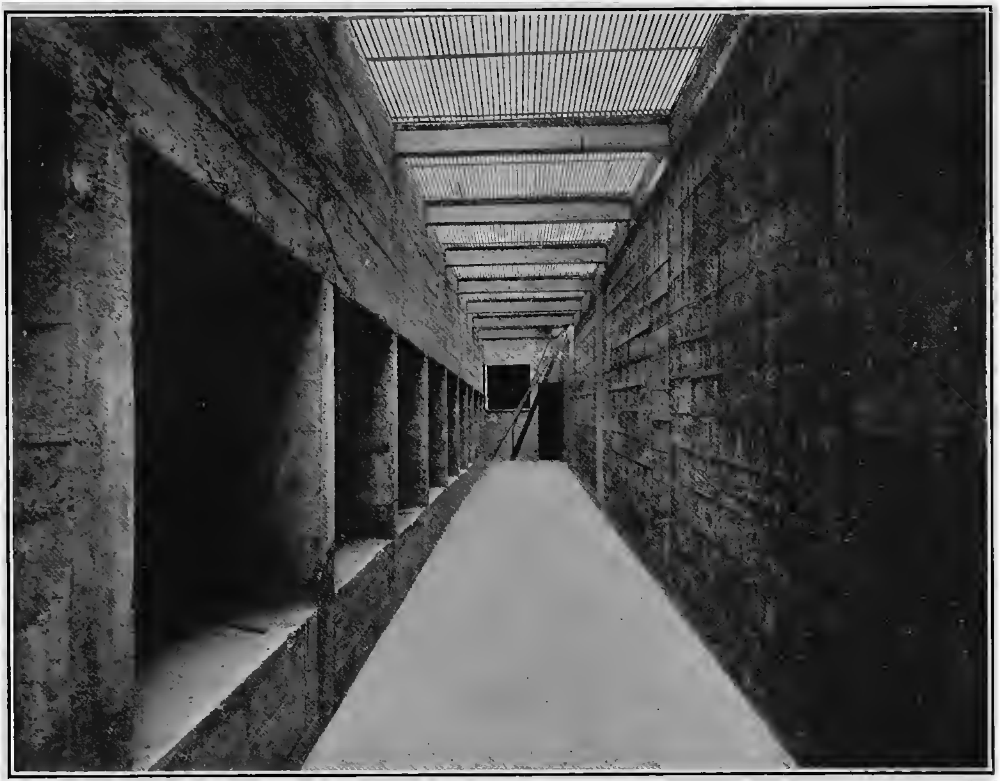
The sanitary quality of the subway air was investigated by Dr. George A. Soper. A preliminary report submitted by him appeared in the report of the Board for 1905. His final report is annexed hereto. He states that, regarded as a whole, there is little cause for alarm concerning the sanitary conditions of the subway air. The air has been renewed with sufficient frequency to assure an ample supply of oxygen and prevent the detection of unpleasant odors due to the large number of people using the subway.

The heat conditions were investigated by the engineering staff of the Board, and the results stated in its 1905 report. No recommendation had been made at that time, however, as to what should be done to improve the conditions. The principal conclusions from these investigations are:

GENERAL CONCLUSION FROM PREVIOUS INVESTIGATIONS.

1. Before operation, the subway in winter was warmer and in summer cooler than the street. In the spring and fall the inside and outside temperatures were about the same.

2. Almost all of the electrical energy consumed in operating trains (about 83 per cent. of that generated at the central power house), is utilized in overcoming friction and is thereby transformed into heat in the subway. In addition to this heat a relatively small amount of heat is given off by passengers using the



Franklin Street Ventilating Chamber, Showing Outlets, Gratings and Emergency Exit.

subway. During the summer of 1905 the amount of heat liberated in the subway from all sources due to the operation of trains approximated an average of 25,285,000 B. T. U. per hour throughout the twenty-four hours, varying from about 4,689,000 to 42,400,000 B. T. U. per hour.

3. The greater part of all this heat is dissipated through the floor, sidewalls and roof of the subway structure into the adjacent ground. A relatively small amount is carried out of the openings of the subway by the exhaling and inhaling action of the trains. The effect of the remaining heat is to increase the temperature in the subway after operation.

4. There are seasonal changes in the subway temperatures. The average temperatures at interior points are about 12, 20 and 15 degrees in winter, spring and summer, respectively, higher than the temperatures before operation, and generally about 25 and 6 degrees in winter and summer, respectively, higher than the temperatures of the outside air. At stations the average temperatures are about 5, 15 and 12 degrees higher than before operation, and 18 and 3 degrees higher than the outside air, during corresponding seasons.

5. Such renewal of air as does take place is frequent enough for the ordinary purposes of ventilation, as ventilation is commonly understood, but is not sufficient to remove any large amount of the fine particles of iron dust due to an excessive wear of the rolling stock and rails. Also the renewals are not frequent enough, nor do their maximum effect occur at the proper periods, to materially reduce the heat in the subway. Therefore, the air must be removed more frequently than at present throughout the whole subway.

6. The problem of improving the conditions in the subway is mainly one of Heat Disposal; in consequence of this resort must be made to some method of cooling it, to be determined upon by actual experiment.

RECOMMENDATIONS.

In order to improve the conditions in the subway throughout the year, and more particularly during the summer, the following recommendations were made to the Board on March 22, 1906:

1. That the air be completely removed from the subway once every half hour through chambers located midway between stations, thereby inducing an inflow of fresh air at the stations.

2. That the removal of the air be accomplished by the combined action of automatic louvres and motor-driven exhaust blowers; the louvres to be relied upon during the daytime, and the blowers at night.

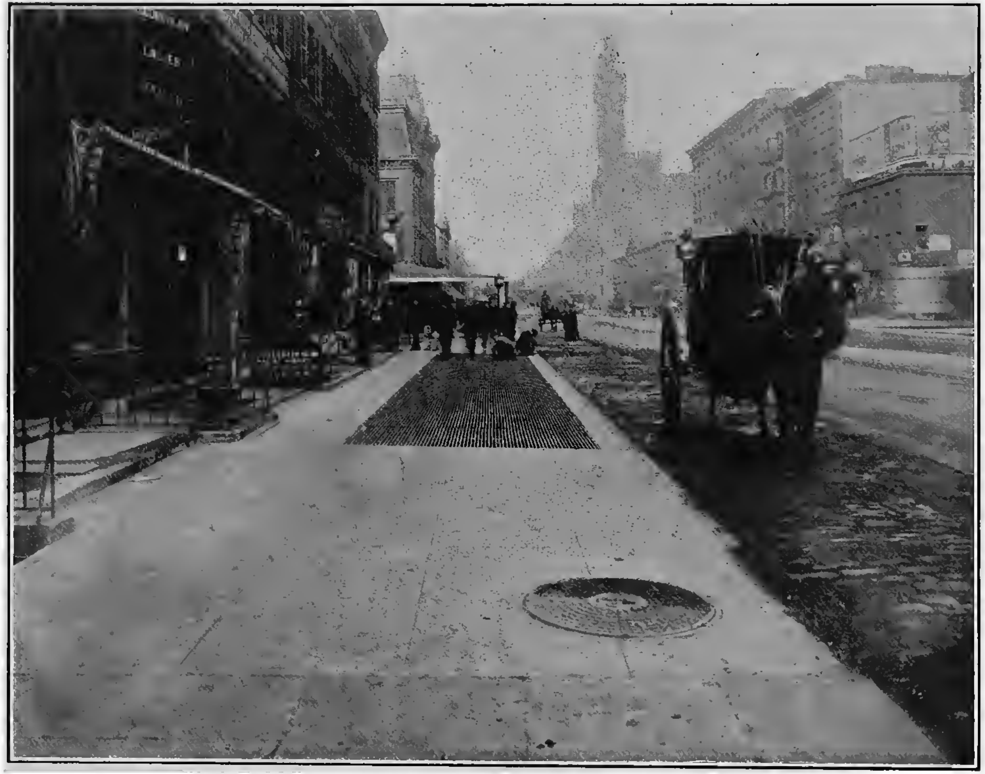
3. That additional openings be provided at the stations to facilitate the inflow of fresh air.

4. That extensive experiments be conducted during the summer in order to determine the best method of cooling the air, since recourse must eventually be had to cooling, in addition to air renewal.

All plans for immediate improvement were confined to that portion of the subway between the Brooklyn Bridge and 96th street stations, leaving the Broadway and Lenox avenue branches for future consideration.

The subway between the Brooklyn Bridge and Columbus Circle is about 4½ miles long and it contains 14 stations. Its interior volume is approximately 18,500,000 cubic feet. There are 89 stairway openings at the stations aggregating about 3,870 square feet, approximating 1 square foot of stairway opening for every 4,800 cubic feet of interior volume. No openings between stations were provided in this section when the subway was constructed.

Between Columbus Circle and 96th street there are 7 stations inclusive, in about 2 miles distance. The interior volume is about 8,500,000 cubic feet. The 20 stairway openings aggregate only 922 square feet, or 1 square foot for about 9,200 cubic feet of interior volume, but there are also 17 ventilating openings between the stations with a total area of 1,734 square feet. The stairway



Gratings in Sidewalk for Ventilating Chamber, Thirty-First Street and Fourth Avenue.

and ventilating openings combined equal 2,656 square feet—1 square foot for 3,200 cubic feet of interior volume, as compared with 1 square foot for 4,800 cubic feet south of Columbus Circle. As a result of this greater ratio of opening, the condition in the subway above the Columbus Circle station is always better than in the section below it.

After much study of the problem and numerous conferences with the Interborough Company the general principle was agreed upon that the best results could be obtained, under the conditions existing in the subway, by exhausting the air at points about midway between the stations, and thereby causing an inflow of air through the station openings. By this means the freshest air is always secured at the station and such iron dust as may be liberated is also drawn into the interior and out through the exhaust openings there provided.

Two mechanical means were available for exhausting the air —automatic louvres or valves and exhaust blowers driven by electric motors.

The louvres are movable and are operated entirely by the movement of the trains in the subway. They are so constructed that they will only open outward, and are balanced so that they always remain closed, except when the air pressure inside is greater than that outside. The air pressure produced by a train as it approaches the openings in which the louvres are placed forces them open. An outflow of air is thereby induced, and continues until the train has passed the louvres, when they immediately close. The air necessary to replace that removed can be drawn in only through the station openings. By this means a flow of air (more or less intermittent) is produced through the station openings into the stations and thence through the subway to the interior outlets. The operation of the louvres is dependent entirely upon the train movement; therefore, the volume of air removed by them during any time of the day will depend upon the number of trains moving during that period.

The Interborough authorities questioned the effectiveness of the louvres, but the results of observations made by the Engineering Department upon an experimental section justified their use. It was found that approximately an average of 19,000 cubic feet per minute were discharged through 100 square feet of louvres between the hours of 6 a. m. and 8 p. m.; an average of 14,400 cubic feet per minute between 8 p. m. and 1 a. m., and 4,800 cubic feet per minute between 1 a. m. and 6 a. m.

If the air is to be renewed only for the purpose of ventilation, the instalment of a sufficient number of louvres would unquestionably bring about the desired results; for the volume of air renewed is nearly directly proportional to the number of trains operated, hence to the number of passengers carried. When, however, air renewal is desired also to aid in removing heat from the subway, train action should be supplemented by other devices such as blowers; especially should this be done during the night hours, when so few trains are operated. At this time the amount of heat liberated is at a minimum, and the outside temperature lowest, and consequently the greater cooling effect is reached by air renewal.

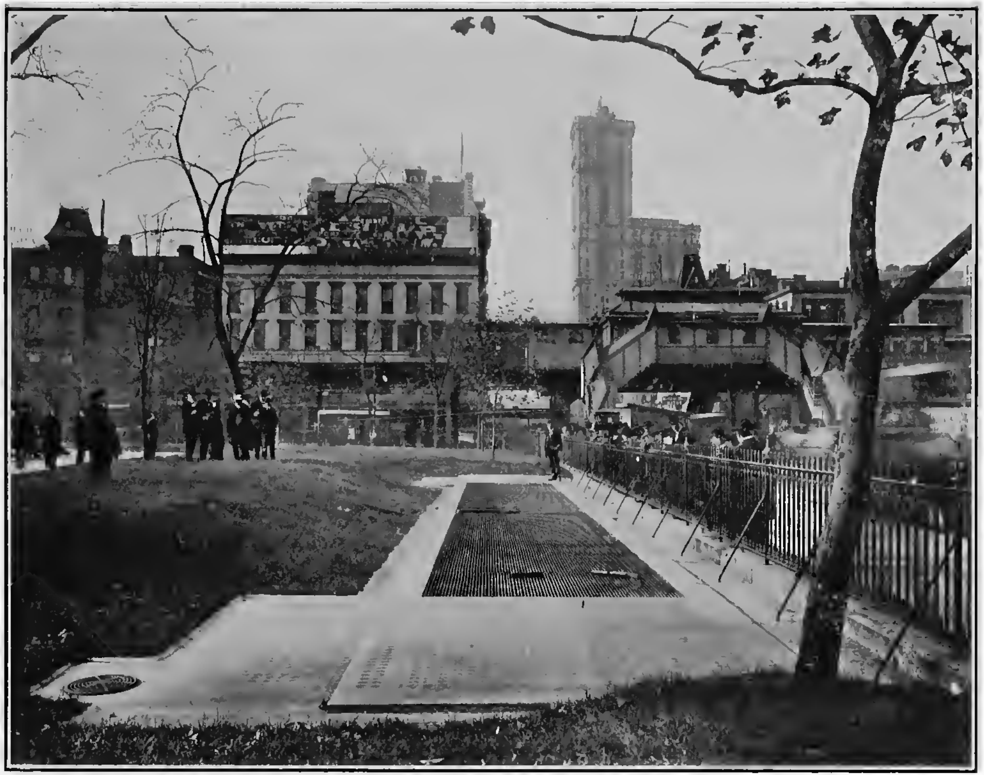
Again, in the original construction no provision whatever had been made for renewing the air in case the subway should become filled with smoke. Under such circumstances the signals would be obscured and trains would be stalled; the louvres, therefore, would not be operative. Blowers should be provided for such an emergency.

The louvres or valves are not in themselves original, but their adaptation for use in the subway was conceived by one of the assistant engineers.

The work undertaken for the purpose of accomplishing the above improvements was divided into four parts, each having its particular characteristics.

1. Cutting openings in the vault lights from the Brooklyn Bridge to the 96th street stations, inclusive, and installing gratings therein, in order to provide additional inlet openings at stations to facilitate the inflow of fresh air.

2. Constructing fourteen ventilating chambers adjacent to the subway between the Brooklyn Bridge and Columbus Circle sta-



Grating and Vault Lights for Ventilating Chamber at Bryant Park.

tions, inclusive, and installing blowers and louvres for the purpose of exhausting the air from the subway at these points.

3. Installing louvres in the outlet openings now existing in the roof of the subway between the Columbus Circle and 96th street stations to provide for the outflow of air from the subway through these openings.

4. Installing an experimental cooling plant at the Brooklyn Bridge station.

VAULT LIGHT OPENINGS AT STATIONS.

To facilitate the inflow of fresh air at the stations vault lights were cut out and gratings installed at nearly all stations. The area of the additional openings at each station was such that the total inlet opening provided, including the stairway openings, was proportional to the interior volume adjacent to the station. At the fourteen stations between the Brooklyn Bridge and Columbus Circle 4,712 square feet of vault lights were removed. It was estimated that 50 per cent. of this area—2,356 square feet—was effective opening, thereby obtaining a 61 per cent. net increase in the effective openings in this section; 3,611 square feet of vault lights were cut out at the seven stations from Columbus Circle to 96th street, inclusive, amounting to 1,805 square feet of effective area, or a 196 per cent. net increase. Altogether, at the stations from the Bridge to 96th street, 8,323 square feet of vault lights have been removed and gratings installed, providing total effective openings—including stairway openings—of 8,953 square feet, as compared with original openings which amounted to 4,792 square feet, or a total net increase of inlet openings of 87 per cent.

The amount of inlet opening now provided from the Brooklyn Bridge to 96th street equals 1 square foot for about every 3,000 cubic feet of interior volume. It has already been noted that the original openings existing between Columbus Circle and 96th street, including the ventilating openings between stations, amounted to one square foot for every 3,200 cubic feet of interior volume, and that under such conditions this section of the subway has always been cooler than the lower section. The above openings were completed before the summer was over and, as expected, an improvement was immediately noticeable.

Wherever it has been practicable to do so, the vault light openings at the stations have been located over the tracks. Under such circumstances no provision has been made for drainage. When the openings occur over the station platforms copper pans have been placed below the gratings to intercept the drainage, and thereby protect the platform from the weather. These pans interfere more or less with the exhaling and inhaling action through the gratings, and their use is therefore avoided where possible.

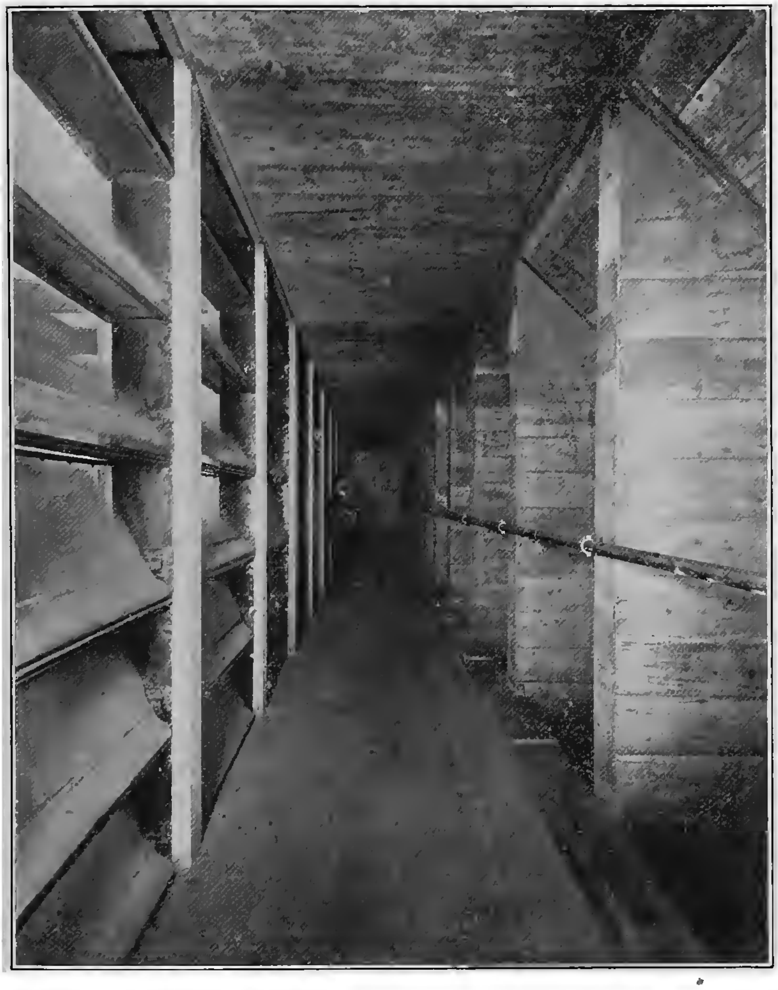
Generally the gratings have been located as near the curb as practicable. They have been placed so that the grating bars run parallel with the curb, and thus with the direction of street traffic. By this means pedestrians are prevented from tripping over the bars. As a further safeguard, non-slipping treads are attached to the tops of the grating bars, sometimes to alternate bars, and at other times to every bar. The latter arrangement has proven more satisfactory.

The above work was ordered to be done on April 20, and completed on July 26.

Renewing the Air Between the Brooklyn Bridge and Columbus Circle Stations.

It has already been stated that the original construction made no provision for openings between the stations in this section of the railroad. To provide the necessary openings, fourteen ventilating chambers have been constructed adjacent to the subway at about the midway points between stations. These chambers are louvre and blower chambers combined. The louvres are operated continuously by the movement of the trains. Generally the blowers are only to be used at night, or for twelve hours out of twenty-four hours during the summer months. During excessively warm periods they may be operated during the whole twenty-four hours. They will always be available for use in an emergency.

Altogether 4,394 square feet of louvre openings have been constructed in the fourteen chambers, thereby providing that amount



INSIDE VENTILATING CHAMBER, BRYANT PARK, BETWEEN THE LOUVRES AND OPENINGS IN ROOF OF TUNNEL.

of outlet openings between stations where none existed originally. It is estimated that the louvres will exhaust from this section of the subway a total of approximately 675,000 cubic feet of air per minute, or effect a complete renewal once in about twenty-seven minutes.

Twenty-five blowers, with from 5 to 7 feet diameter wheels, have been installed in these chambers. The rated delivery of these blowers at normal speed is about 990,000 cubic feet per minute; at maximum speed about 1,230,000 cubic feet per minute, producing in this section 19-minute and 15-minute renewals, respectively. The louvres and blowers combined should produce a renewal once in about 10 minutes.

The chambers are constructed under the sidewalks adjacent to the subway. The air is exhausted from the subway into the chambers through openings in the sidewalls or roof of the structure, and, except in two instances, thence it is discharged into the street through gratings in the sidewalk surface. As at stations, the gratings are located as close as possible to the curbs, with the grating bars running parallel to the curbs. Non-slipping strips are attached to the top of the grating bars. In the two excepted instances noted, the discharge gratings are located in the parkway areas. When practicable adjacent chambers are located on opposite sides of the subway. The chambers are built slightly larger than required for the blowers and louvres, in order to provide for emergency exits from the subway at these points.

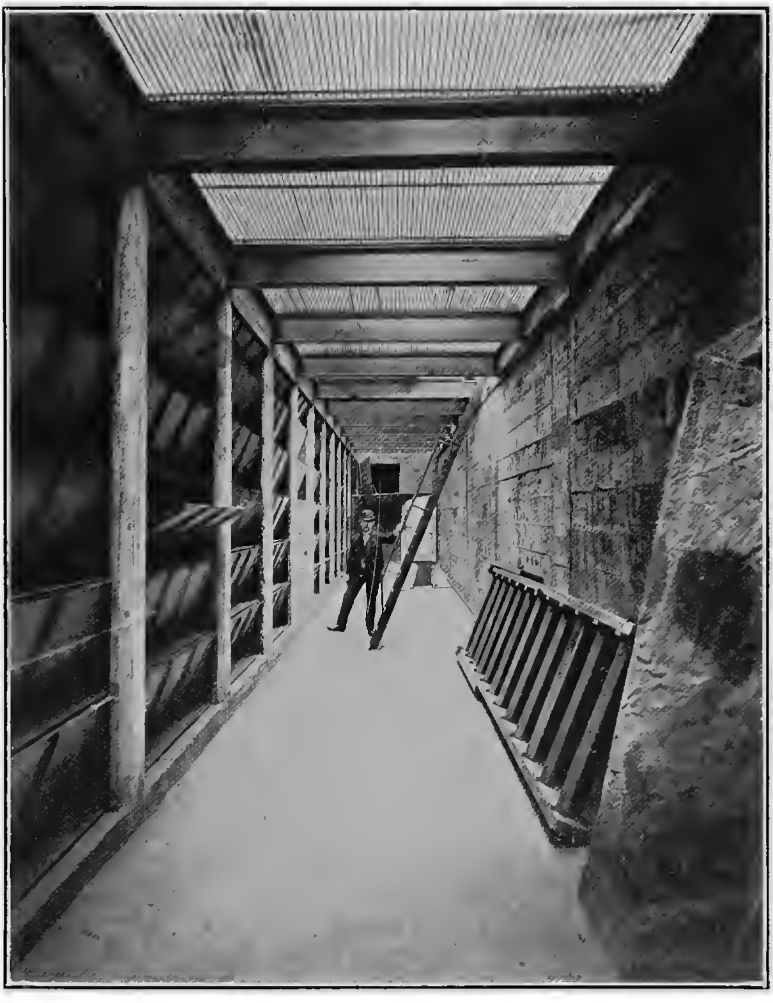
Ladders lead up into the chambers from the floor of the subway and thence up through removable grating sections to the street surface. The locations of these exits in the subway are to be indicated by illuminated "Exit" signs, lighted by an independent lighting circuit. Current from the same circuit is to provide sufficient light in the chambers to show the position of the ladders leading to the street.

The louvres are constructed of galvanized black iron reinforced with standing ribs or stiffeners. A round bar axle is attached to the louvre at one-third of its depth from the bottom. Small wheels are attached to the ends of the axle. The bottom of the louvres is counterweighted with a piece of round bar iron inserted into a roll provided for it. The louvres are placed in louvre boxes made of galvanized sheet iron reinforced with bar iron. Inside of the ends of the boxes small cast metal grooves are attached, in which the small axle wheels roll, thereby providing a roller bearing. The louvres are counterweighted sufficiently to hold them closed; the smallest increase of pressure inside the subway opens them, and so permits an outflow of air. As observed from a moving train the louvres will generally appear closed. They are installed in either a horizontal or vertical position. The louvre units are generally about 1 foot 6 inches deep by 4 feet 4 inches long. Their dimensions vary a small amount, however, depending upon size of the roof or wall openings. They are placed in the openings in several tiers, the number of tiers depending upon the total width or depth of the openings. The area of louvre opening in each chamber is proportional to the interior volume of subway between the adjacent stations.

The blowers are fully housed with steel housing, and have single inlets. The wheels are 5, 6 and 7 feet in diameter, driven by 15, 25 and 30 h.p. motors, respectively. Generally the motors are direct connected. With free inlet and outlet, the conditions under which they will generally operate, the 5-foot blowers will exhaust 27,700 cubic feet per minute, at 330 revolutions per minute; the 6-foot blowers, 40,300 cubic feet, at 275 revolutions; and the 7-foot, 53,800 cubic feet, at 235 revolutions. They are capable of exhausting 25 per cent. more air at their maximum speed.

As with the louvres, the blower capacity in each chamber is proportional to the interior volume between the adjacent stations. In eleven of the fourteen chambers the required capacity was obtained by installing two blowers, one in each end of the chambers. Thus the units were duplicated as far as possible. In each of the other three chambers it was practicable to install only one blower.

A special cable is being installed to provide current for operating the blowers. The blower motors are to be so controlled that they all may be put in operation simultaneously from the sub-power houses in case of emergency.



Bryant Park Ventilating Chamber, Showing Louvres, Gratings and Emergency Exit.

TABLE GIVING TOTAL AMOUNT OF GRATINGS, COPPER PANS, LOUVRES AND FANS INSTALLED AT STATIONS AND VENTILATING CHAMBERS.

Stations.	Ventilating Chambers.	Area of Grating Installed, Sq. Ft.	Area of Copper Pans, Sq. Ft.	Fans.		Lou-vres, Sq.Ft.
				No.	Diam.	
Wall Street		27	41	..	..	...
	City Hall Park	346	...	2	5	253
Brooklyn Bridge		1,098	226	..	..	...
	Duane Street	366	...	1	7	260
Worth Street		157	...	..	..	...
	Franklin Street	343	...	1	6	226
Canal Street		...	...	..	..	...
	Grand Street	423	...	1	7	270
Spring Street		256	300	..	..	...
	Prince Street	500	...	2	6	244
Bleecker Street		395	453	..	..	...
	4th Street	426	...	2	6	435
Astor Place		448	...	..	..	...
	11th Street	540	...	2	6	371
14th Street		961	...	..	..	...
	Union Sq. Park	281	...	2	5	234
18th Street		...	...	..	..	...
	20th Street	337	...	2	5	220
23rd Street		...	...	..	..	...
	25th Street	387	...	2	5	224
28th Street		...	...	..	..	...
	31st Street	563	...	2	6	350
33rd Street		244	267	..	..	...
Grand Central		767	894	..	..	...
	Bryant Park	635	...	2	7	528
Times Square		224	270	..	..	...
	Long Acre Sq	550	...	2	6	346
50th Street		128	126	..	..	...
	55th Street	668	...	2	7	433
Columbus Circle		377	...	..	..	...
		...	...	..	..	315
66th Street		685	...	..	..	...
		...	...	..	..	315
72nd Street		196	...	..	..	...
		...	...	..	..	315
79th Street		666	...	..	..	...
		...	...	..	..	315
86th Street		668	...	..	..	...
		...	...	..	..	315
91st Street		326	...	..	..	...
		...	...	..	..	210
96th Street		693	...	..	..	...

This work was ordered on May 17 and completed on November 1.

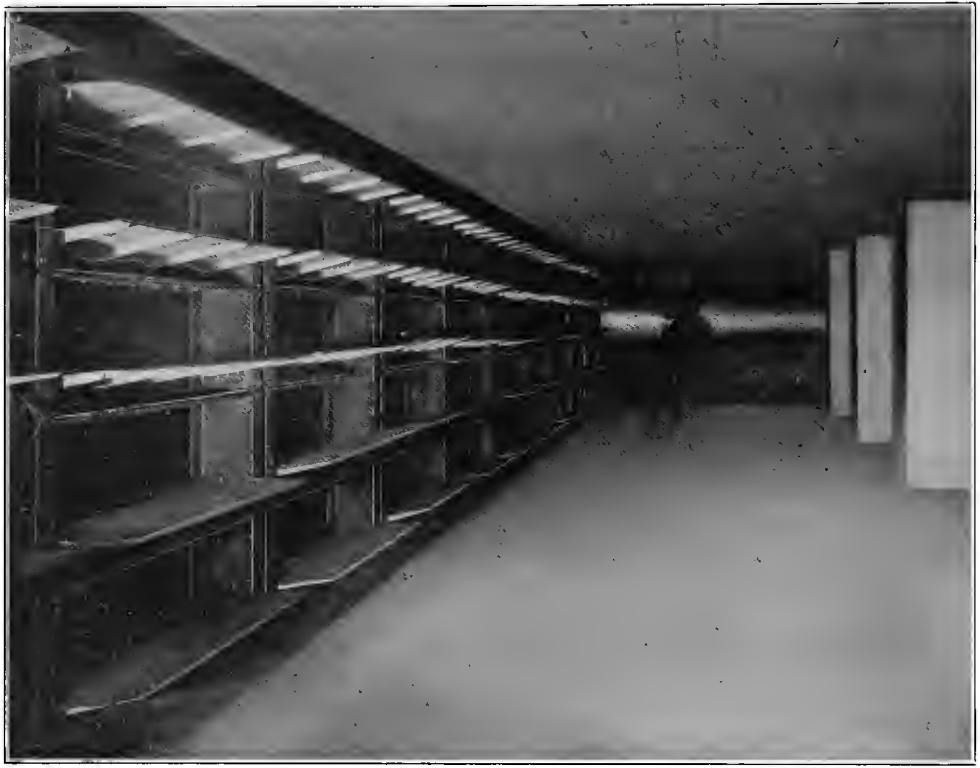
RENEWING THE AIR BETWEEN THE COLUMBUS CIRCLE AND 96TH STREET STATIONS.

When the subway was constructed 17 ventilating openings were provided through the roof under the parkway surface between Columbus Circle and 96th street. One thousand seven hundred and thirty-four square feet of louvres have been installed in these openings. They will exhaust approximately 260,000 cubic feet per minute, or renew the air in this section about once every 33 minutes.

This work was ordered on May 17 and completed on December 30.

To accomplish the same measure of improvement in this portion of the subway as the work which has been done south of Columbus Circle is expected to attain, it is proposed to install blowers in chambers constructed adjacent to the central openings between the stations.

The plans carried out, as have been described, provide for a measure of renewal throughout the year by means of the louvres, and a maximum renewal during excessively warm periods by louvres and blowers combined. They insure a positive renewal during the night hours in mid-summer by the blowers, thereby attaining the maximum cooling effect possible due to renewal; they provide emergency exits from the subway between stations, and, finally, they furnish means for a positive removal of smoke from the subway in case of fire.



Ventilating Chamber, Forty-Seventh Street and Broadway—Louvres Opened.

BROOKLYN BRIDGE COOLING PLANT.

This plant was designed by Mr. John E. Starr, Consulting Expert. Its purpose was to demonstrate what degree of cooling could be obtained from cold water pumped from the ground. Work was begun upon the installation of the plant on July 2, and it was completed and put in operation on August 29. Its operation was continued through the remainder of the summer until the last of October. The plant was operated only during the day time, from 7 a. m. to 8 p. m. on week days, and from 10 a. m. to 8 p. m. on Sundays.

During a test made upon the plant on September 19, between 4 p. m. and 6 p. m., when the average temperature of the outside air was 85.4 degrees, the cooling effected produced an average temperature on the station platforms of 80.9 degrees, or 4.5 degrees cooler than the outside air. Comparing this result with a similar condition of outside temperature without cooling, we find that on July 19, 1905, between 4 p. m. and 6 p. m., when the outside temperature averaged 84.1 degrees, the Brooklyn Bridge Station averaged 91.1 degrees, or the station air was 7 degrees warmer than the outside air. We find, further, before the cooling plant was put in operation, that the Brooklyn Bridge station was always from 2 to 6 degrees warmer than the Fourteenth Street and Grand Central stations; after it was operated, the Brooklyn Bridge station was from 2 to 4 degrees cooler than the same stations.

While the above plant has indicated an effective means for cooling the subway air wherever ground water can be obtained, its extension throughout the subway would involve a large expenditure. Such an extension is not justifiable until another summer has shown what measure of improvement will be brought about by the ventilating chambers and openings at stations which have just been completed.

The following is Mr. Starr's report upon the test of the plant:

MR. GEORGE S. RICE, *Chief Engineer,* THE BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS:

DEAR SIR—I have the honor to present herewith my report on the test of the cooling plant at the Brooklyn Bridge subway station.

Scope of Report.

The scope of this report is intended to cover only the practical results obtained, and does not include a technical discussion of the subject, or the development of a heat balance between the fluids cooled and warmed.

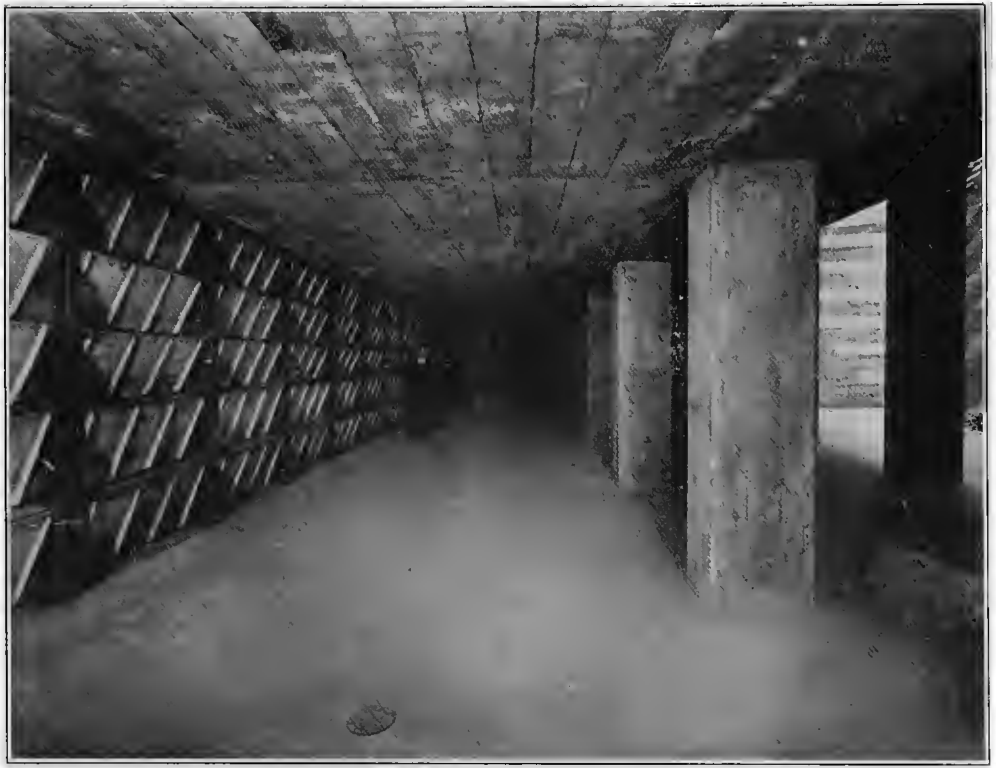
Arrangement of Plant.

The plant was installed exactly as designed by me, as set forth in my previous reports, and in accordance with the original plans, which are on file in your office, and therefore needs no other description except to recall the fact that it consists of two (2) units, one on the east and one on the west side of the station. Each unit consists of two (2) artesian wells, from which water is pumped by electrically driven triplex pumps, through a bank of pipe situated on the unused local platform on each side. This bank of piping is enclosed in a galvanized iron casing, which has an inlet at one end connected to the discharge of two (2) electrically driven fans delivering about 75,000 cubic feet of air per minute for each unit, or 150,000 cubic feet per minute for the entire station. The other end of the pipe chamber connects with galvanized iron ducts leading over the island platforms. These ducts have grated openings about 20 inches by 28 inches, discharging directly downward on the platforms. The water runs in counter-current with the air.

This plant was started August 29, and run continuously into October, 1906, and intermittently when required since.

Water Supply.

It was expected and designed to use 400 gallons of water per minute, but when the wells were sunk it was found that the level of the water was lower than expected, and rather than lose time in lowering the pumps to the bottom of the station, it was decided to place them on the platform level, from which point only about 200 gallons per minute were obtained altogether. A larger supply might have been obtained from the platform level, but it was deemed unwise to speed the pumps on account of the danger of



VENTILATING CHAMBER, FORTY-SEVENTH STREET AND BROADWAY—LOUVRES CLOSED.

losing suction at times and injecting air into the piping system, which would cause more or less trouble.

Besides this 200 gallons seemed sufficient to maintain a comfortable temperature in the station under the existing conditions.

The fans took suction directly from the air in the station, turning it over and over, including such air as was drawn in at the passenger entrances by the action of the trains and ventilating chambers on each side of the station.

Record of Test.

The test was made under the direction of Mr. Turner and myself on October 19, 1906, when the outside temperatures ranged from 85 degrees to 90 degrees. This test was continuous from 10:30 a. m. to 6 p. m. Readings were taken at intervals of 10 minutes for certain portions of data, and at 15 and 30 minutes for other portions, according to the necessity of including every fluctuation.

I have arranged the summary of these readings in two (2) periods. The first period runs from 10:30 a. m. to 4 p. m., when the train movement was comparatively even, and the second period from 4 p. m. to 6 p. m., during a time of increased train movement. It will be observed from the tabulation of the results that, although the outside temperature was lower during the last period, the station temperatures were higher, due to increased train movement. This is, of course, a characteristic of subway temperatures. I present the result of the test in Table 1 herewith. (Table 1 appended.)

Discussion of Results.

I call your attention to some of the relations disclosed by the table.

During the first period (from 10:30 a. m. to 4 p. m.), the temperatures tabulated as "in the flow," indicated that persons standing on the platform, under or near the gratings, were in a current of moving air of a temperature of 76.8 degrees on the west platform, or 9.8 degrees below the outside air. This flow of air was perceptible for a distance of five (5) or six (6) feet radius from a point on the platform below the centre of grating, and as the gratings were spaced on about ten (10) feet centres, the "flow" areas practically overlapped.

On the east platform this "flow" air temperatures averaged 79.5 degrees or 7.1 degrees below the outside air.

Elsewhere on the west platform, where the air was not in so rapid motion, the temperature was 80.7 degrees, and on the east platform 81.9 degrees, while the air on the street was 86.6 degrees. At all points on the platforms, however, the air was in fairly rapid motion.

It was particularly noticeable that the regular passengers at this station would line up in the zone of the more swiftly moving air. I consider, after spending much time in this station observing the operation of the system and the effect on the public, that a divided distribution of the air such as is accomplished by the ducts, and frequent openings, is essential to the success of any cooling method, as far as the platforms are concerned, as it contributes greatly to the comfort of the passengers by promoting evaporation from the body. I have observed little or no fanning by the passengers standing in the station while this plant was in operation.

The humidity on the platform, ranging from 64 to 68 degrees, seems satisfactory.

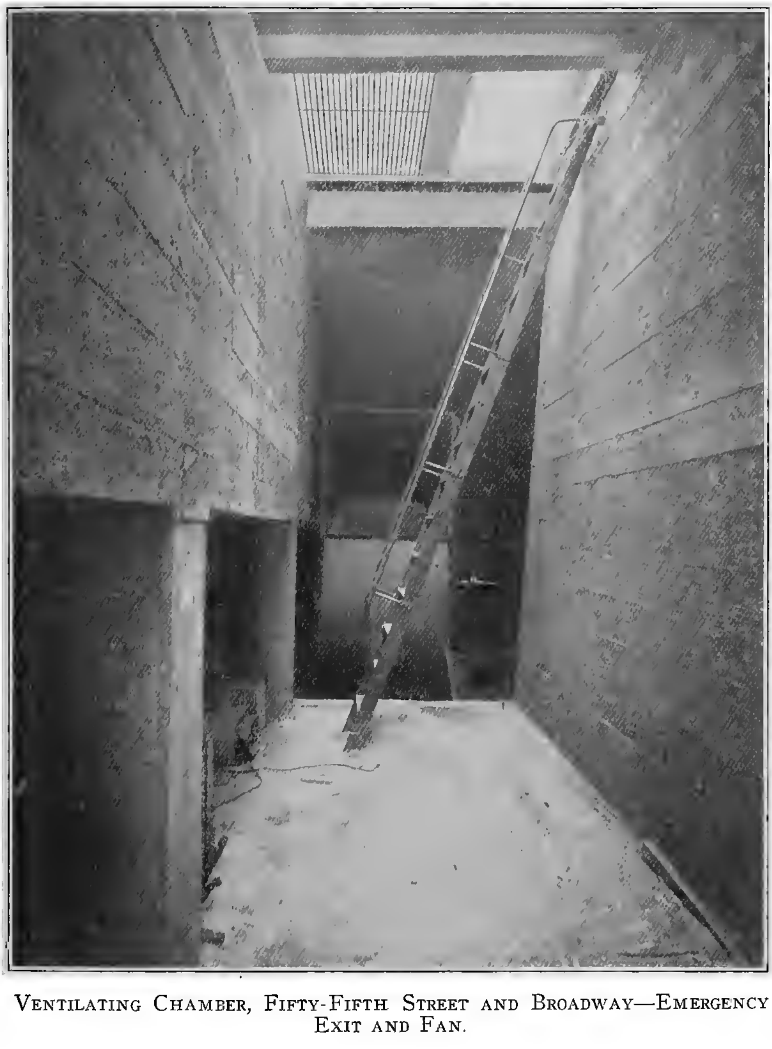
It is perhaps needless to draw your attention to the fact that a comparison between the outside temperature and the inside temperature is not the only measure of the results obtained by any cooling system. The results should be compared with temperatures that would have obtained under the same condtiions of outside temperature with and without cooling.

I find, for example, from your records that on July 19, 1905, between 4 p. m. and 6 p. m., the outside temperature averaged 84.1 degrees, while the Brooklyn Bridge station averaged 91.1 degrees, or the station air 7 degrees higher than the outside air. In this test of September 19, 1906, during the same hours, the outside air averaged 86.2 degrees, while the station averaged 80.9 degrees, or 4.5 degrees below the outside air.

It will be noted that during this test the ventilating chambers on each side of the Bridge station were in operation, and that air, by reason of their operation, was drawing in at the Bridge station, and was being taken care of by the cooling apparatus. How far the cooling of the air at the station affected the temperatures in the subway on each side to the ventilating chambers I cannot say, as arrangements were not made to investigate this feature.

However, whether the influence in this direction was large or small, it will be remembered that only one-half the calculated amount of cooling water was used.

My original calculations included the taking in of 150,000 cubic feet of air at 90 degrees and cooling to 75 degrees with 400 gallons of water. There is hardly a doubt but that this amount of water can be procured when the pumps are lowered to gain about four (4) feet on the suction.



Ventilating Chamber, Fifty-Fifth Street and Broadway—Emergency Exit and Fan.

There then seems to be no doubt that the original calculation is quite safe. The figures were based on a heat transfer of 7.5 B. T. U. per square foot per hour per degree of difference, between the means of the temperature of air and water, and the plant was laid out on that basis.

From Table 2, herewith, it appears that the actual results showed that we are quite within safe limits, as the actual transfer was between 9.4 B. T. U. and 11.3 B. T. U. per square foot per degree of difference of means, and that the range of the air was about 8 degrees on 200 gallons of water. Therefore, a range of 15 degrees may be safely counted on with the full supply of 400 gallons, with an initial temperature of 90 degrees, and a consequent wider difference of means.

Note on Air Handling.

Observations of preliminary tests showed that, owing to the heat generated by train movement, the temperature at this station at the inlet of the fans, holds at about 78 or 79 degrees, even when the outside air is below this temperature.

It would be desirable, therefore, to construct an inlet duct to the suction from the outside air, controlled by a damper, so that when the outside air drops below, say, 78 degrees the damper may shut off suction from the station and turn on suction from the outside. In this way the station air can always be kept below the outside air, down to about 70 degrees, when the outside is below 75 degrees, which I assume will be as low a point as it will be desirable to reach. The shifting of the damper can be controlled automatically by thermostat if desired.

Extension of the System.

If the results of the operation of this apparatus seem satisfactory, I would be glad to take up the subject of its extension to other stations.

Respectfully submitted,

JOHN E. STARR.

NEW YORK, October 30, 1906.

TABLE 1.

	FIRST PERIOD. 10 A. M. to 4 P. M.			SECOND PERIOD. 4 P. M. to 6 P. M.		
	Average. West Side.	Average. East Side.	Average. Both Sides.	Average. West Side.	Average. East Side.	Average. Both Sides.
Gals. water, per min.	110.00	91.90	201.90	105.20	88.70	193.90
Lbs. water, per min.	917.40	766.46	1,683.80	877.36	740.13	1,617.50
Cubic ft. air, per min.	72,400.00	73,200.00	145,600.00	73,980.00	73,800.00	147,780.00
Temp. air inlet to fans.	81.30	83.12	82.21	83.04	85.00	84.02
Temp. air outlet from fans	73.89	75.10	74.49	75.00	75.50	75.25
Range of air	7.41	8.02	7.72	8.04	9.50	8.77
Temp. water inlet to coils	61.10	61.10	61.10	61.10	61.10	61.10
Temp. water outlet of coils	75.10	76.68	75.64	76.00	77.57	76.78
Range of water	14.00	15.18	14.54	14.90	16.47	15.68
Temp. air on platform in the "flow" under gratings	76.80	79.50	78.15	77.90	81.00	79.45
Temp. air platforms not in the "flow"	80.70	81.90	81.30	81.90	82.80	82.35
Avge. temp., platform	78.70	80.70	79.70	79.90	81.90	80.90
Humidity, platform	68%	69%	68.5%	68%	64%	66%
Outside air, temp	86.60	86.60	86.60	85.40	85.40	85.40
Outside air, humidity	60%	60%	60%	60%	60%	60%
Air in "flow" on platform *under* outside air	9.80	7.10	8.45	7.50	4.40	5.95
Avge. air on platform *under* outside air	7.90	5.90	6.90	5.50	3.50	4.50
Highest temp. of outside air, at 12:20 p. m.	88.30	88.30	88.30	.....	.....	.....
Avge. platform temp., 12:20 p. m.	78.70	80.20	79.45	.....	.....	.....
Difference	9.60	8.10	9.85	.....	.....	.....
Highest temp. of outside air, at 4:50 p. m.	.....	.....	.....	86.20	86.20	86.20
Avge. temp, at 4.50 p. m., on platform.	.....	.....	.....	79.80	81.20	80.50
Difference	.....	.....	.....	6.40	5.00	5.70

TABLE 2.

SHOWING RATE OF HEAT TRANSFER PER SQUARE FOOT PER DEGREE DIFFERENCE OF MEAN TEMPERATURES.

	West Side.	East Side.
Pounds of water per minute	917.40	766.40
Range of water, degrees	14.00	15.08
British thermal units per minute	12,843.00	11,557.00
British thermal units per hour	770,580.00	693,420.00
Mean temperature of water	68.10	68.59
Mean temperature of air	77.59	79.11
Difference of means	9.49	10.52
Heat transfer per hour per degree of difference	81,200.00	65,914.00
Surface	7,200.00	7,000.00
Transfer per degree difference per hour per square foot	11.30	9.40
Tonnage per day, expressed in terms of melting ice, tons	64.20	57.80

Total tons, 112 per day.

In connection with this work of ventilation, I desire to express my appreciation and thanks to Mr. L. B. Stillwell, Dr. E. B. Rosa and Mr. H. St. Clair Putnam, representing the Interborough Company; also to Dr. George A. Soper and Mr. John E. Starr, and to Mr. Alfred Craven, Deputy Chief Engineer, and Mr. D. L. Turner, General Inspector of Stations, for their able assistance in connection with the problem. The structural designs for the ventilating chambers were prepared under Mr. Sverre Dahm, General Inspector of designs, and they were constructed under Mr. D. L. Turner, General Inspector of Stations, and Messrs. George Hallett Clark and John H. Myers, Division Engineers.

REPORT OF A SANITARY INVESTIGATION OF THE AIR OF THE NEW YORK RAPID TRANSIT SUBWAY, COVERING THE PERIOD FROM JULY 1 TO DECEMBER 31, 1905.

Mr. ALEXANDER E. ORR, *President, Board of Rapid Transit Railroad Commissioners,* No. 320 Broadway, New York City:

SIR—In accordance with your request, as communicated to me by Mr. George S. Rice, your Chief Engineer, I have made a careful sanitary investigation of the subway, with special reference to the condition of the air. As requested by Mr. Rice, the investigation covered the period from July 1 to December 31, 1905.

The results of my investigation have been made the subject of frequent written and verbal reports to Mr. Rice during the progress of the work. A summary of the leading facts brought out and my conclusions up to October 1 were contained in the preliminary report which I submitted to your Board on October 19, 1905.

The following report covers the results of my investigation for the whole six months. It contains, first, a brief review of some of the most essential facts and conclusions which have resulted from the investigation; second, a concise but more extended digest of the data; third, in appendices, the data in full, with comprehensive tabulations and summaries.

In all there have been about 2,200 chemical analyses of air, 3,000 determinations of bacteria in the air and about 400 other analyses in special studies of oils, dusts, disinfectants and other substances. About 50,000 determinations of temperature and humidity were made before the present system of automatic and continuous temperature records could be adopted.

Considerable care was taken in the selection of my assistants and it is to their skill and intelligence that a large share of credit is due for the results. From first to last, the number of my assistants was twenty-one. About two-thirds of this number were college or technical school graduates.

Mr. George S. Rice, Chief Engineer to your Board, has been continually consulted with respect to the conduct of this investigation. New lines of inquiry and estimates of expenditures were submitted to him before being decided upon. The work was laid out in accordance with his wishes and has been carried on with the object of assisting him in his more comprehensive studies of methods of cooling and ventilating the subway. Mr. Rice supplied me with much information concerning the construction and operation of the road and I regret that I have not been able to use any of these facts in my report.

I have also enjoyed the benefit of assistance from a number of friends in Columbia University, among whom I may mention Dr. Charles F. Chandler, Professor of Chemistry; Dr. T. Mitchell Prudden, Professor of Pathology; Dr. William Hallock, Professor of Physics, and Dr. Philip Hanson Hiss, Adjunct Professor of Bacteriology. To these and others whose personal and scientific interests have aided in this work, I desire to express my appreciation and thanks.

Review of Principal Conclusions.

A fact which was appreciated at the outset of my investigation, and which should never be lost sight of in considering the results, is the great extent of the space under consideration and the large number of conditions which were capable of affecting the air. It should not be assumed that what has been found true for one time and place has a general application, nor that what has been found to hold good for the subway as a whole must also hold good for every part of it. I am moved to make these remarks because of the necessity of having to use many averages and isolated figures in stating the results and because of my inability to present the data adequately within the brief time and space available. Had it been possible to give all the tables, diagrams and discussions upon which my conclusions are based, a much more comprehensive knowledge of the subject could have been given.

Regarded as a whole, the results of the analyses indicate that the air of the subway was frequently renewed. Yet several considerations prevent this seeming excellence from being regarded by me as conclusive. In view of the great importance which attaches to some of the subjects investigated, it would have been advantageous if more time and attention could have been concentrated upon them.

There are no records by which to judge whether the air of the subway is, or is not, as satisfactory as it has been found feasible to make the air of the best foreign underground roads. The published tests of ventilation of subways in other parts of the world have neither been extensive nor conducted under conditions at all comparable with those in the Rapid Transit Subway of New York. The conditions in the Boston subway approach nearest to those here. From the few analyses which have been reported, the air in the Boston subway appears to be less satisfactory than the air in the New York subway.

The study of the question of dust resulted in the discovery of many important facts regarding the properties of the peculiar black, metallic dust of the subway. The great aggregate weight of iron which is ground up and thrown into the air by the operation of the trains, and the association of these particles with organic and oily substances and bacteria suggested the need of various inquiries which would have carried this investigation beyond the period of time allotted.

From the beginning of my investigation, the air was warmer in the subway than out of doors. Had no trains been running it would have been cooler inside than outside during the summer. In the fall the average temperature would have been about the same inside and out. In the winter the temperature would have been, as it has been, warmer than in the streets, but this difference would have been less. I have not thoroughly investigated the causes or remedies for the heat, these subjects being beyond the restricted scope of my studies, but I have accepted the undisputed opinion that it was derived chiefly from the motors and other electrical apparatus. Computations show that the heat emanating from the passengers has played but a small part in elevating the temperature.

Observing that in operating the road a considerable amount of power is used which, in my judgment, could be saved, and that the existing ventilation of the subway carried off much of the heat produced, I ventured to suggest in an earlier report that benefit would result from increasing the openings to the outside air and improving the cars and methods of operating them. That part of my suggestion which related to the effectiveness of openings has been fully supported by the results of analyses of the air.

Not only the movement of the trains but the action of the wind in the streets has caused the air to circulate in and out and between stations. So great has been the amount of ventilation produced in these ways that the effects of centrifugal fans and other devices which have been experimentally used to increase the ventilation have been completely hidden.

Sanitary considerations do not lead me to view the heat of the subway in summer with alarm. In fact, the conditions in winter, when strong draughts of cold air enter the stations, are far more apt to affect health. The difference in temperature between the subway and streets was much less in hot weather than was generally understood. The average temperature of the subway in July and August was 5.6 degrees higher than that of the streets, and in the hottest week it was about 10 degrees higher. It is true that greater differences than these occurred for short intervals of time, but the greatest difference generally occurred in the early morning or at night when few people were traveling. When the outside air was hottest the difference between the subway and street was least.

Careful observation has convinced me that in many cases sensations ascribed to heat have been due in part to odors and other unpleasant conditions which it is practicable to improve. I place much importance on the need of preventing unnecessary odors and dust, and believe that if the subway is kept in a strictly clean and sanitary condition that that degree of heat which is inevitable will have no injurious effect upon health. As to the effect upon travel due to the discomfort caused by the heat in summer, it seems reasonable to believe that the public will adapt itself to the discomfort due to the unavoidable heat, if it is known that the subway air is reasonably pure and as agreeable as it is practicable to make it. However desirable, it should not be expected that the air of the subway will ever be as cool and pure as the air of the streets any more than that the air of the streets will be as fresh and pleasant as the air of the country. There must always be some heat, dust, odor and noise, produced by the friction and wear and tear of the machinery. If it is found feasible to cool and otherwise improve the air by refrigeration, fans or other mechanical means, the advantage of doing so is apparent, but if this result cannot be accomplished the consequences will not be found disastrous. Of far more importance than the question of heat is the need of maintaining proper conditions of cleanliness in the subway.

The sanitary administration of the subway has been the most unsatisfactory feature brought out in this investigation. Inspection has shown the existence of conditions which call for immediate improvement. The stations and toilet rooms have not been kept in a clean and orderly condition. It is difficult to criticise too severely the filthy condition of the roadbed at the stations or the neglected condition of ventilation and cleanliness in some of the toilet rooms. Unless these conditions are corrected they may very promptly be regarded as suitable subjects for the attention of the Board of Health.

Digest of Results.

The different subjects which have received my attention in this investigation will, for convenience, now be considered more fully under the following heads:

I. Temperature and Humidity of the Air,
II. Chemical Condition of the Air,
III. Bacterial Condition of the Air,
IV. Present Ventilation and Effects of Ventilation Experiments,
V. Odors in the Subway,
VI. Dust in the Subway,
VII. Sanitary Care of the Subway.

The methods employed in studying these questions have been, for the most part, such as have been used in other sanitary and meteorological investigations in which a high degree of accuracy has been required. The suitability of the method to the work in hand was in all cases carefully tested. In some instances special apparatus and methods of analysis had to be devised, but, for the most part, the methods have been only such as were standard and capable of being duplicated. For the most part the air analyzed has been that at an elevation of 18 inches to 2 feet above the pavement. This height was decided on as the most convenient and suitable after comparative tests of the air at different elevations. But few samples were taken of the air of the cars, since this was the desire of your Chief Engineer.

TEMPERATURE AND HUMIDITY OF THE AIR.

Early Methods of Observing Temperature and Humidity.

The earliest date upon which any systematic record of temperature or humidity seems to have been made in the subway was June 26, 1903. At that time a number of maximum and minimum thermometers and stationary wet and dry bulb hygrometers, with some recording thermometers, were placed in the subway at various places between City Hall and Columbus Circle, at different points above Fifty-ninth street and outside.

The accuracy of the observations made with these instruments was carefully studied by me, with the result that the temperature observations were found to have been correct, probably to within 5 degrees, and the humidity observations to within 20 per cent. The readings were generally too high. Owing to these errors and the unfavorable location of some of the instruments, the data which were collected with them should be interpreted with caution.

Methods of Observing Temperature and Humidity from July 1 to September 18, 1905.

Temperature and humidity observations were first undertaken by me on July 1, 1905. They were taken with sling psychrometers designed as made for the United States Weather Bureau, with some minor changes intended to fit them especially for the subway work. They were tested by me at a testing station established for the purpose of determining the accuracy of the various instruments employed in the investigation, and were found to be correct to 1-10 of 1 degree Fahrenheit. Four observers were employed in making the psychrometer observations. Each visited a given number of stations each day and observed the temperature and humidity of the inside and outside air. The express stations were usually visited twice. As a rule it was feasible to make observations only at certain hours of the day; the late afternoon, night and early morning were not generally included. Yet the data so obtained, when worked into averages for the days and weeks, give a good idea of the conditions experienced by the patrons of the road. For one week, August 10 to 16, observations were made throughout the day and night, and the data so collected were carefully tabulated and compared with the daily averages obtained in the usual way. Both sets of averages agreed closely. The total number of temperature and humidity observations to October 1 was about 50,000, considering the temperature and humidity observations separately. The relative humidity was calculated from the readings of the psychrometers by means of tables issued by the United States Weather Bureau. Tables showing the times and places where temperature and humidity observations were made, with the results in full, together with daily and weekly averages and summaries of maxima and minima results, have been transmitted to your Chief Engineer and constitute Appendix No. 1 of this report.

Final System of Obtaining Records of Temperature.

The observations with sling psychrometers were not intended to furnish the data from which the most important deductions concerning the ventilation of the subway were to be derived. The instruments needed for this purpose were thermographs, which were capable of giving continuous records. On September 18 a number of new thermographs were set up, and those which had been used since 1903, after careful test and adjustment, were relocated.

The thermographs were placed in specially constructed cages in the stations of the subway, generally on the east side and south end of the platform, as far removed as possible from local draughts and other temporary disturbing conditions, about 4 feet from the pavement. The total number of thermographs which have since been in use is twenty. All were made by J. Richard, Paris, and on test were found capable of recording slow changes of temperature to within 1 degree of temperature and 15 minutes of time, if visited daily and kept clean and adjusted. A special observer was trained to keep them in good condition, to check their readings with a sling psychrometer, to make necessary adjustments and to renew the record sheets every week. The records have been systematically filed. The management of the thermographs and the observation of relative humidity were turned over to your engineering corps on November 18, with the recommendation that the system be made permanent.

Observations with a delicate mercurial thermometer have shown that changes of temperature occur in the subway of far greater extent and frequency than is indicated by the thermographs. The latter have an inertia or lag which causes them to respond with less promptness than mercurial thermometers to rapid changes of temperature. In some cases thermographs which were capable of showing fluctuations of as much as 6 degrees within an hour's time failed to record changes of 7 degrees in one minute. The thermographs show average conditions.

Temperatures in the Subway Before It Was Opened.

In view of the overheating of the subway air which took place in the summer of 1905, it is interesting to briefly review some of the temperature characteristics of the road before it was thrown open to travel. In reviewing these figures it must be remembered that the entrances, exits and blow holes were more or less closed at this time, and that the free circulation of air was correspondingly obstructed. Had all the present openings been free there would have been less difference between the air inside and out.

During construction and before the subway was covered by a roof its temperature was practically that of the outside air. After the roof was put on a marked difference became visible. The temperature of the subway was much more constant than that of the outside air. Before trains were run, hourly and daily changes outside seemed to affect it but little, while the more marked and continued changes produced visible effects.

In winter the air outside was cooler and in summer warmer than the air of the subway. The total range of temperature of the subway air at One hundred and twelfth street for the year, August 6, 1903, to July 27, 1904, was from 22 degrees to 68 degrees, or 46 degrees, while the range outside was from 2 degrees to 94 degrees, or 92 degrees—twice as great.

During the hottest week in the subway, before it was opened, the temperature, according to the One hundred and twelfth street records, averaged 59.4 degrees, while the street temperature was 77.7 degrees; difference 18.3 degrees.

The records are not sufficiently numerous or exact to enable us to determine the normal temperature of the earth through which the subway runs. In fact, this temperature probably varies according to the depth under the surface and other conditions. In the deep tunnel which runs under the Harlem Meer in Central Park a temperature of 54 degrees was frequently observed in June and July, 1903, although the temperature outside at the same time reached 95 degrees.

In the year in which the road was opened the subway at Columbus Circle averaged about 15 degrees warmer than the average temperature outside. In March and April the average temperatures inside and out were about the same. From the middle of April to the end of September the subway at Columbus Circle was cooler than the air outside.

Temperatures Immediately After Opening the Subway.

From the middle of August until the opening day, October 27, 1904, the subway air was gradually cooling from the highest point which it had reached in the summer, and from that time to the end of the year the temperature gradually fell. The large amount of travel which the subway experienced at the start did not visibly affect the decline in temperature which was to be expected at this season of the year. For the first ten weeks of 1905 the subway was only slightly warmer than in 1904. It is not clear that this difference was solely due to the fact that the road was in operation. The temperature outside was warmer than it had been during the year before.

Beginning about the middle of March, or at that season when, in other years, the average temperature inside and outside had been about the same, the heating of the air due to the operation of the road first became distinctly visible. Instead of the outside air becoming warmer than the inside, as had been the case the year before, the average temperature inside remained higher. Thenceforth higher temperatures in the subway became the rule both winter and summer.

Temperatures Since July 1, 1905.

Throughout my investigation the air of the subway has been warmer than the air of the streets. This difference has increased considerably during the autumn and winter months. In the early part of July the difference between the average temperature for the day, inside and outside the subway, was less than 5 degrees. In the latter part of September it was over 10 degrees. In January it was at some stations about 20 degrees warmer than the outside air; an average difference for a week of 30 degrees was found at one station.

Referring now to the observations of temperature and humidity made by the sling psychrometers, we are prepared to obtain a more accurate idea of the conditions which obtained in the summer after the subway was opened. The subway air grew warmer as the summer season advanced. It averaged 81.0 degrees through July. In the week of August 4 to 10 it was 83.4 degrees. Thereafter it declined very gradually until the latter part of September, when it was 76.0 degrees. In the week of September 29 to October 5 there was a slight rise to 78 degrees. This was followed by a more rapid decline than had occurred at any time before, and excessively high temperatures were not again experienced.

During its warmest period the temperature of the subway followed the temperature of the outside air, except in its more extreme and rapid changes. The correspondence is seen to be most marked when the data for the inside and outside air are compared as weekly and monthly averages. The average temperature in the subway for the daytime for July and August combined was 82.4 degrees; it was 76.8 degrees outside; difference 5.6 degrees.

The Highest Temperatures in the Summer of 1905.

The highest temperature observed by me in the subway was 95 degrees. This occurred at the Brooklyn Bridge Station July 18, 1905.

The hottest week was that of August 4 to 10, inclusive. The average daily temperature for the subway during this time was 83.4 degrees; for the outside air 78.2 degrees; difference 5.2 degrees. The maximum temperature observed in the subway during this hottest week was 88.2 degrees; in the streets it was 88.2 degrees at the same time.

Humidity.

The relative humidity in the subway has generally been less than out of doors, but the dew point has been higher. In other words, the amount of moisture present has been actually greater, but it has appeared less in the subway than out of doors. There have been no fogs nor mists in the subway. A faint haze has not been uncommon.

The average relative humidity of the subway for July and August was 57.5 per cent.; for the outside air 60.6 per cent.; difference 3.1 per cent. The greatest average relative humidity occurred during the week when the average temperature was highest. During this period the relative humidity averaged 64.4 per cent.

Value of Thermograph Records.

The records obtained from the thermographs, established in the middle of September, give an excellent idea of the average differences in temperature which have existed between the subway and the streets, and between one subway station and another. They also show hourly fluctuations in temperature which give clues not only to the origin of the heat, but to the extent and method of ventilation, movement of trains and a considerable number of other instructive conditions. Daily observations with the sling psychrometer give a sufficient knowledge of the relative humidity and dew point.

Warmest and Coolest Stations.

The coolest station, as indicated by the thermographs, has been Canal Streeet and the warmest Astor Place. The lowest temperature recorded at Canal street was 30 degrees; outside temperature 14 degrees; difference 16 degrees. At the same time the air at the Brooklyn Bridge and Astor Place Stations was 54 degrees, or 40 degrees warmer than the outside air. The express stations, with the exception of Ninety-sixth street, have all been warmer than the local stations in their vicinity. The greatest range in temperature has occurred where there has been the greatest ratio between the area of the openings to the outside air to the cubic air space of the stations.

CHEMICAL CONDITIONS OF THE AIR.

Carbon Dioxide, the Leading Test.

The chemical analyses of the air have chiefly been confined to the determination of carbon dioxide. No other test could give such a correct knowledge of the extent to which the air was vitiated and none could be made in such large numbers as were wanted with so little probability of error.

The method used in this analysis was that of Pettenkofer, with modifications described by Hempel in his "Methods of Gas Analysis," New York, 1902. Samples of air were collected in specially made round-bottom flasks of 2 litres capacity. No pains were spared to make the results accurate. Preliminary tests indicated that the results were probably correct to within about 3 parts in one million. The total number of samples analyzed was 2,084. Tables showing the times and places of collection, and results in full, with daily and weekly averages and summaries of maxima and minima results have been transmitted to your Chief Engineer and constitute Appendix No. 2 of this report. The results of carbon dioxide determinations are stated in parts per 10,000 volumes.

Slight Value of Analyses for Oxygen.

About eighty samples of air were analyzed for oxygen. The method employed in this analysis is that given by Hempel in which the oxygen is absorbed by phosphorus. The difference between the amount of oxygen present in the subway and the streets was so slight and uninstructive that the determinations of oxygen were soon discontinued as a routine procedure. Tables showing the times and places of collection, and results in full, with daily and weekly averages and summaries of maxima and minima results, have been transmitted to your Chief Engineer and constitute Appendix No. 3 of this report. The results are stated in percentages by volume.

General Results.

The chemical analyses of air produced results from which the following conclusions have been derived:

The average amount of carbon dioxide in the subway air has been slightly larger than in the air of the streets. The average of all results is: for the subway, 4.81, and for the streets, 3.67; difference 1.14. This difference is comparatively slight. At no time was the amount of carbon dioxide large. The greatest amount of carbon dioxide found in the subway was 8.89. This occurred in the tunnel between the Grand Central Station and the Thirty-third Street Station on December 27, 1905, at 6.02 p. m.

The carbon dioxide in the air of the subway varied according to the season, amount of travel, hour of day, place where the sample was collected, amount of carbon dioxide in the outside air, and the velocity of wind in the streets.

There was more carbon dioxide found in the autumn than in the summer or winter.

Hourly Variations in the Amount of Carbon Dioxide.

The amount of carbon dioxide varied in the streets at different hours of the day. It was highest between 5:30 and 6 p. m. and lowest between 1 and 3:30 a. m. The amount increased from the minimum of the early morning hours to about 9 a. m., after which there was a fall to about 1:30 p. m., followed by a rise to the highest point of the day, which occurred between 5:30 and 6 p. m. The average range outside, as determined by hourly results, was .8 part per 10,000.

In the subway the greatest amount of carbon dioxide occurred between 5:30 and 6 p. m. Thereafter there was a gradual fall to the lowest point, which was reached between 3 and 4 a. m. The amount increased steadily in the morning to about 9 a. m., after which it fell irregularly to between 1 and 2 p. m. The average for the whole day frequently agreed closely with the amount found between 1 and 3 p. m. In the late afternoon there was a rapid rise to the maximum for the day, which was reached at about 5:30 p. m. The difference between the greatest and least amount of carbon dioxide was, according to these hourly averages, 2 parts per 10,000.

Differences in the Amount of Carbon Dioxide at Different Parts of the Subway.

There was more carbon dioxide in the air at express stations than at local stations except at the specially well ventilated express station at Ninety-sixth street. Among the principal express stations the largest average amount of carbon dioxide was found at Fourteenth street. Then came the Brooklyn Bridge, Grand Central, Seventy-second and Ninety-sixth Street Stations, in the order named.

There was more carbon dioxide in the air between stations than at the adjoining stations, although this difference was in most cases very little. The results of 227 analyses show this difference to have been .31 part per 10,000.

A marked difference occurred in the amount of carbon dioxide found in the section of the subway above Fiftieth street and the section below that point. The average of all results which were capable of showing this difference demonstrated that the air above the Fiftieth street dividing line was much purer than the air further down town.

Results of Oxygen Determination.

The samples of subway air which were analyzed for oxygen were collected from 9:30 a. m. to 5:05 p. m., between Brooklyn Bridge and Ninety-sixth Street Stations.

The average amount of oxygen found in the air of the streets was 20.71 per cent.; in the subway 20.60; difference .11. The least amount found in the subway was 20.25.

BACTERIAL CONDITION OF THE AIR.

The studies which I made concerning the bacteria in the subway relate almost solely to their number. It was not practicable, within the time and scope planned for this investigation, to do more. My views upon the desirability of further bacteriological studies were set forth in reports submitted to your Board and your Chief Engineer in November and December.

The Quantitative Methods Employed.

The bacteria were collected by allowing them to settle from the air upon circular plates about 3½ inches in diameter, containing a standard agar culture medium, or by straining them from the air by means of sand filters.

About 2,800 plates were exposed. The time of exposure was usually fifteen minutes. Most of the exposures were made at the subway stations at points as far removed from draughts as possible. Exposures out of doors were made, for the most part, in the streets on the line of the subway beyond the influence of subway air. After the plates were exposed they were taken to the laboratory and incubated at the temperature of the human body for forty-eight hours. The colonies of bacteria which developed in this time were then counted. Care was taken to exclude molds from the count. Full tables and daily and weekly summaries of bacterial results with the plate and filter methods have been transmitted to your Chief Engineer and constitute Appendices Nos. 4 and 5 of this report.

The collection of bacteria by the use of sand filters provided means for estimating the numbers contained in a measured volume of air. After a considerable amount of preliminary work the method adopted was substantially that devised by Prudden and described in "Studies from the Department of Pathology of the College of Physicians and Surgeons," Vol. 7, 1900. The results with filters were more accurate than the results with plates, chiefly for the reason that the method of collection was more satisfactory.

The results obtained by the two methods furnished a useful check upon one another.

Additional Bacterial Work.

Beside the routine estimates of the numbers of bacteria present in the air special studies were made of the length of life of the pneumococcus in the subway, the numbers of bacteria in accumulated dust, the action of lubricating oil upon bacteria, the molds present and the efficiency of various commercial deodorants and germicides. The results of these studies have either been communicated in writing to your Chief Engineer or are contained in separate appendices to this report.

General Statement of Bacterial Results.

A careful examination of all the bacterial data collected in these studies, excepting the data which relate to the dust, leads to the following conclusions:

There were, on an average, more than twice as many bacteria found in the air of the streets as in the air of the subway, excepting after rains, when fewer were found outside than inside. The average number of bacteria which settled from the air in fifteen minutes and were developed upon the plates was: in the subway, 500; outside, 1,157; difference, 657. The average number of bacteria found by filtering the air was 3,200 per cubic meter of air in the subway and 6,500 per cubic meter of air in the streets; difference, 3.300.

Molds.

The molds recovered from the air by the filters were almost always less numerous in the subway than out of doors. The average number of molds found were: Outside, 75 per cubic meter; inside, 80 per cubic meter; difference, 5 per cubic meter. The maximum number was 1,100, found under Central Park. The average ratio of molds to bacteria, as determined by the observations with filters, was 1 to 40 in the subway and 1 to 87 in the streets.

Effect of Winds and Draughts.

The wind in the streets had a decided effect upon the numbers of bacteria found both outside and inside of the subway; the averages show that outside five times as many were found with a wind of 18 miles per hour as with a wind of 9 miles.

The numbers in the subway varied with the more decided changes in the streets.

The bacteria were more numerous near the stairways than at the ends of the stations.

The bacteria were more numerous on the side of the station into which the wind blew from the streets than on the opposite side.

There were more bacteria at the ends of the platforms where the trains left than where they arrived.

The numbers of bacteria in the air of the subway varied with the amount of travel. They were most numerous when the number of passengers and trains were most numerous and fewest when the passengers and trains were fewest.

Effect of the Oily Roadbed.

It was not found that any harmful germs were capable of multiplying in the oil which dripped in large quantity from the machinery of the cars upon the broken stone ballast and wooden ties. On the contrary, this oil apparently removed and collected from the air large numbers of bacteria.

Vitality of Pneumococcus.

The pneumococcus, probably the infective cause of a common form of pneumonia, was found capable of retaining its virulence in dried sputum in the subway for twenty-three days. According to Wood, who made studies of the resistance of this germ for the Commission for the Investigation of Respiratory Diseases of the New York City Department of Health, the pneumococcus is killed in four hours in sunlight.

Condition of the Air in the Toilet Rooms.

With few exceptions there were fewer bacteria in the air of the toilet rooms than in the rest of the subway. In some cases the numbers were much greater.

The proprietary disinfectants used in the toilet rooms had no germicidal or deodorizing value.

PRESENT VENTILATION AND EFFECTS OF VENTILATION EXPERIMENTS.

A thorough study of the ventilation of the subway was not undertaken by me, and in view of the comprehensive investigation of methods of ventilation and cooling which, I understand, has been made by Mr. Rice, Chief Engineer of the Commission, I made no effort to obtain a further knowledge of this subject than was necessary in order to interpret my analyses. Consequently, some of the following remarks should be regarded rather as notes than as settled conclusions:

The size and location, as well as the shape, of the openings between the subway and the street, were found to be matters of controlling importance in ventilating the subway.

The amount of carbon dioxide at different stations varied approximately as the ratio between the cross sections of the openings and the cubic contents of the stations.

The removal of about 280 square feet of vault lights at Ninety-sixth street gave immediate and sensible relief in the hot summer weather, but the opening of 90 effective square feet in the roof of the stations at Fourteenth street, of 180 effective square feet at the Grand Central Station and 170 effective square feet at the Brooklyn Bridge Station was not enough to make their consequences felt.

With respect to the location of blow holes, it appeared possible to determine with scientific exactness the conditions under which they may be most effective. Blow holes have been proved in this investigation to have much value in aiding ventilation. In fact, special studies of the condition of the air above and below Fiftieth street showed plainly that the air was much purer in the sections which have blow holes than in those which do not have them.

Currents of air due to the combined action of the wind in the streets and the motion of the trains were measured at several stairways. As a result of eighty observations at eight stations, the air was found to have moved in and out of the subway at an average rate of 573,000 cubic feet per hour at a single stairway.

A local train was observed to push out about 15,000 cubic feet and an express train about 45,000 cubic feet of air through the passageways of a local station. This air was replaced after the trains passed by corresponding indraughts from the streets. The same air did not move in and out of the subway, but fresh air replaced the subway air. The maximum velocity of air moving in at any stairway was 16 1-3 miles per hour. On this occasion the air was passing through this stairway at the rate of 3,800,000 cubic feet per hour.

The use of centrifugal fans, as experimented with under the direction of your Chief Engineer near the Brooklyn Bridge, Fourteenth Street and Bleecker Street Stations, and the use of automatic louvres between Fifty-ninth and Sixty-sixth streets, did not produce results which were visible, although about 800 analyses of carbon dioxide were made to observe them.

Observations of the passage of air from one station to another showed that the air of the subway, outside of the trains, may, in some cases, move from one station to the next at the rate of 640 linear feet per minute. The air between stations never became badly vitiated, according to my analyses. It is true that the largest amount of carbon dioxide found (8.89) was between two stations, but on this occasion the average amount at the adjoining stations was also high (7.79).

It is regrettable that a census could not have been made to determine the number of passengers carried and the frequency with which the trains were operated, since this would have enabled me to estimate with some precision the frequency with which the air of the subway was renewed. Unfortunately, no figures have been available which were capable of giving even an approximate idea of the number of persons in any part of the subway at any time. The only estimates of the passengers carried were based on the total number of tickets sold at the different stations per month.

ODORS IN THE SUBWAY.

Odors have been more or less present at all times and at nearly all places in the subway. In some cases, they have been so faint as hardly to be noticeable, and in others they have been very decided. The effects upon the passengers have varied with the sensitiveness of the individual. The most serious effects noted have been headache and a mild form of nausea. The odors have been most apparent during hot, damp weather, where the greatest crowding has occurred, and at stations which received the least amount of ventilation.

Unusual pains were taken to ascertain the causes of the odors. It was not possible to analyze them chemically or to measure them by other means than the senses, although samples of subway dust and air, when brought to the laboratory, often bore the odors distinctly, but by examining a large number of substances, heated and cold, and by attempting to duplicate the odors of the subway in closed rooms under suitable conditions of temperature and humidity, some of the causes have been discovered.

Causes of Subway Odor.

The broken stone ballast on the roadbed has been responsible for much of the odor noted in the subway. This broken stone was made from trap rock and its peculiarly slaty odor in the warm atmosphere of the subway could easily be distinguished, especially at the more open stations on damp days. Frequently, however, this odor was masked by others.

The oil used in lubricating the wheels and machinery of the cars has been one of the principal causes of odor. Large quantities of this oil, which is composed partly of fish and petroleum products, were allowed to drip from the machinery of the cars upon the ballast and ties of the roadbed. The odor of this oil rising from the roadbed and from the hot machinery has been particularly prevalent and persistent. It has existed in the air in a finely vaporized condition. Samples of subway dust have always contained a small percentage of this oil.

A pungent and unpleasant odor has been given off by the proprietary disinfectant used in the toilet rooms. This odor has been especially disagreeable and so penetrating that it has occasionally been noticed on the streets outside of the subway. Laboratory tests have shown that the use of this compound has not been justified by its germicidal or deodorizing effects. In fact, it has no value in these directions.

A strong and peculiarly disagreeable odor has been produced by an oily cement used in fastening decorative tiles in place at some of the stations. The oil employed in making this cement has an unpleasant odor, and to disguise it a substance having a still more decided and unpleasant odor has been employed. Fortunately, the odor of the tile cement has not been lasting.

Hot boxes, of which there was a considerable number when the road was first put in operation, have at times produced a persistent and suffocating odor.

The odor of tobacco smoke has been common at the stations. The rules against smoking in the subway have not been strictly enforced. Lighted cigars, cigarettes and pipes have often been carried into the trains.

Odors from concrete and paint have repeatedly been noticed. The former has been persistent, the latter transient.

Odors of human origin have sometimes been present in the air of the subway, particularly during warm, damp weather and where there was much crowding.

Excepting in rare instances where ignorant employees have not been under strict supervision, the odors of the subway have not pointed to conditions dangerous to health.

Dust in the Subway.

The dust of the subway was made the subject of a special study because of the possibility that it might play an important part in producing or aggravating respiratory diseases.

Methods of Analysis.

The dust was examined microscopically, chemically, bacteriologically, and by a special method devised for determining the gross weight of dust in a measured volume of air. A table showing the chemical composition of eleven samples of subway dusts is contained in Appendix No. 6 of this report. A table giving the numbers of bacteria found in forty-three samples of subway and outside dusts is given in Appendix No. 7. The gross amount of dust found in 171 samples of subway and outside air at various places is given in Appendix No. 8 of this report.

Inspections of the cars and machinery were undertaken and inquiries were made concerning the total loss in weight per month of brake shoes, rails, wheels and other metallic parts of the subway equipment. To have determined in the most positive way whether the breathing of subway dust produced any effect upon health required a line of study which was beyond that authorized by the Commission. My views with respect to the desirability of prosecuting further inquiries into this matter have been communicated to you.

Physical Characteristics of the Dust.

In appearance the dust was always black and very finely divided. Owing to the presence of a small amount of oil it had a peculiarly adhesive character which caused it to attach itself securely to all kinds of surfaces even when these were vertically placed and glazed. All parts of the subway which had not been recently cleaned or painted or were not of a dark color bore evidence of this black dust when my investigation began. It had a marked capacity for soiling linen and other light colored clothing. In summer the dust often produced yellow stains on the clothing of persons who remained long in the subway.

When examined microscopically the dust was found to be composed of particles of many substances, conspicuous among which were thin, flat plates of iron. In fact, these could be seen with the naked eye upon the hats and garments of persons who had been riding in the subway.

The size of the particles depended upon the place where they were found. The largest were visible on the roadbed. Most of the particles were so small as to escape notice, except where beams of sunlight entered the subway.

Particles of dust, not iron, comprised bits of silica, cement, stone, fibres of wood, wool and cotton, molds and undistinguishable fragments. Besides the dust which resulted from the grinding of metals, it was evident that the gradual wear and tear of everything in the subway contributed to the dust. The importance of maintaining the subway in a cleaner condition became very manifest from these studies.

Chemical Composition of the Dust.

The chemical analysis of eleven samples of accumulated dust from the subway indicated the following average percentage composition; Total iron, 61.30, including 59.89 metallic iron; silica, etc., 15.58; oil, 1.18; organic matter, 21.94. See Appendix No. 6.

Weight of Dust in the Air.

The average weight of dust found in the subway air, using all the results, was 61.6 milligrams per thousand cubic feet of air; in the streets 52.1 milligrams; difference of 9.5 milligrams. The maximum amount found in the subway was 204 milligrams. Twenty-three comparative tests were made to determine, with particular care, the weight of dust per thousand cubic feet of air inside of the subway and in the streets at the same time and as near the same place as possible. These showed an excess of dust in the subway of 47 per cent. over that outside. In five cases there was more dust outside, the greatest excess being 30 per cent. In the other eighteen cases the excess of subway dust over outside dust ranged from 11 to 800 per cent.

The amount of dust found in the air of the subway varied with a number of circumstances. More dust was found at the arrival ends than at the departure ends of the station platforms. This was probably due to the fact that the brakes were applied near the arrival ends. More dust was found just before and just after the hours of greatest travel than at any other period of the day. The stations where the greatest weights of dust were found were express stations; there the amount of metallic dust formed by the braking of the trains was much greater than at the local stations.

Numbers of Bacteria Contained in Subway and Other Dusts.

The number of bacteria found in the dust of the subway was usually smaller than the number found in dusts which had accumulated outside. The average result of analyses of thirty samples of dust which had accumulated in the subway was 500,000 bacteria per gram of dust. The average obtained from six samples of accumulated dusts collected in different buildings in New York was 600,000. The largest number found in the subway was

2,000,000 per gram. For comparison with these figures it is interesting to note that dust which had accumulated in a Broadway theatre contained 270,000, in a fashionable hotel 360,000, in a Fifth avenue church 320,000, in a tall office building 850,000, and in the attic of a country house 150 years old 110,000 bacteria per gram.

Molds in the Subway Dust.

Dust which had accumulated in the subway contained over twice as many molds as dust collected in outside buildings. The ratio of bacteria to molds was 89 to 1 for the subway and 250 to 1 elsewhere.

Further studies of the dust would have been very desirable.

SANITARY CARE OF THE SUBWAY.

The sanitary administration of the subway was briefly commented upon in my preliminary report of October 19, 1905, and several specific points of criticism there made were referred to as especially worthy of the attention of your Board.

It does not appear that any of the conditions pointed out have been corrected. It may be well, therefore, to review and extend the suggestion which I formerly made and renew my recommendation that the sanitary care of the subway be improved.

The ballast of the roadbed should be renewed at the stations or, better, replaced with concrete or other smooth surface which can be kept clean. The ballast at many of the stations has served as the receptacle for unlimited quantities of filth of the kind usually consigned to cuspidors. In the matter of expectoration the guards and other employees of the operating company, who should be the sanitary guardians of the subway, are the chief offenders. It seems unnecessary to refer in further detail to this subject. The disgusting and unsanitary conditions to which I refer are sufficiently evident to every passenger. I recommend that the ordinances of the Board of Health relating to spitting be enforced in the subway and that the roadbed at the stations be made clean and kept clean.

Notwithstanding the recommendations of the Board of Health with respect to the sanitary administration of the subway, a copy of which accompanied my former report, dry sweeping has not been abolished at the stations. Apparently the porters and others in charge of cleaning the subway stations have not received precise instructions as to their duties and they are not obliged, as they should be, to follow, in every particular, methods of cleaning and disinfection laid down by a competent superintendent. In sweeping, properly moistened sawdust and hair brooms should always be used. Suitable receptacles should be provided for the fresh and used sawdust, and the latter should be carried off every day.

The sinks, urinals and closets of the toilet rooms should be cleaned at least twice daily with utensils kept solely for that purpose and afterward treated with an efficient disinfectant.

Many of the toilet rooms have been in an unventilated and neglected state. The fan ventilators with which these rooms were to have been provided have not all been installed, in consequence of which the only means of ventilating the closets has been through the doorways to the subway. The warm, humid air of the toilet rooms, combined with the nauseating smell of a deodorant which has been employed, has caused the air to be so unpleasant that the colored porters have often opened the doors and tied them back with strings. I urgently recommend that the toilet rooms be put in proper sanitary condition and kept clean or else permanently closed.

The stairways and platforms have been washed so infrequently that the employees at many of the stations cannot remember when this work was last done. Mopping and scrubbing should be among the chief reliances for keeping the subway clean. With respect to cleaning, the Board of Health has said that the chief cleaning of the stations should be at night immediately after the theatre crowds have gone home. At this time the cars, station platforms and closets should not only be swept, but also thoroughly and properly mopped. They should all be scrubbed once a week at night Dusting of the stations should be done only with moist cloths, which should be properly cleansed after each using. The use of feather dusters should not be permitted either in the stations or the cars.

At least four spittoons, raised from the platforms and containing sawdust, should be placed in each station. These should be cleaned and disinfected at least once a day.

At least one receptacle for papers, plainly labeled, should be placed in each station and should be emptied daily.

At present the cars are cleaned at the yards of the operating company or in the subway itself. They are swept out too infrequently and cleaned inside and out apparenly once in two or more days. Accurate information with respect to this matter has not been obtainable. The Board of Health has recommended that the cars at the yards, after sweeping, should be closed and after not less than three hours should be cleared of the dust which has settled. This should be removed from the seats and woodwork by dry or moist cloths, frequently renewed, and from the floors by large moist mops, repeatedly rinsed in fresh water. Thorough mopping of the floors of the cars should be done at intervals to be determined by experience. I concur in this recommendation and also advise the employment of the modern vacuum cleaning system. By this system the movable dust may be removed from the cars by suction and afterward concentrated and burned. This process should be especially applicable to cleaning the cars while in the subway, if it is necessary to clean them there. If they could be run into the outside air for cleaning this should be done by all means.

Respectfully submitted,

George A. Soper, Ph. D.

New York, February 1, 1906.

WORK OF INSPECTION DEPARTMENT.

All structural work, both mill and shop, for Contract No. 1, was completed by the Department of Inspection of Material at the close of the preceding year; and the records of the Department show practically all structural work completed for Contract No. 2 at the end of 1906. Additional steel material was required to be manufactured and inspected during 1906 for the extension of the West Side viaduct to Van Cortlandt Park, now under construction, and also for guard-rail protection of columns on the sharper curves of the subway, Contract No. 1.

The total weight of steel accepted at the mills since commencing work amounts to:

For Contract No. 1	166,259,579 pounds
For Contract No. 2	24,817,464 pounds

Weight accepted during 1906:

For Contract No. 1	12,254,499 pounds
For Contract No. 2	9,862,508 pounds

Steel was rolled at the following mills:

	Contract No. 1.	Contract No. 2.
Carnegie Steel Company	11,792,512 lbs.	8,197,162 lbs.
Pencoyd Iron Works	397,190 "	1,324,329 "
Brooklyn Stock	64,527 "	2,605 "
American Iron & Steel Manufacturing Company.	......	338,412 "
Jonson Sons	270 "	......
Totals	12,254,499 lbs.	9,862,508 lbs.

This material was distributed for manufacture into finished work at the several branches of the American Bridge Company, and by the Baltimore Bridge Company, as follows:

	Contract No. 1.	Contract No. 2.
Pencoyd branch	1,147,665 lbs.	40,843 lbs.
Trenton branch	9,081,204 "	4,175,803 "
Athens branch	1,960,833 "	5,271,404 "
Brooklyn branch	64,797 "	2,605 "
Ambridge branch	......	23,021 "
Baltimore Bridge Company	......	348,832 "
Totals	12,254,499 lbs.	9,862,508 lbs.

At the several shops there remains, unshipped to date, either in course of manufacture or as available stock, the following tonnage:

	Contract No. 1.	Contract No. 2.
Trenton branch	7,935,814 lbs.	1,471,870 lbs.
Athens branch	......	1,137,631 "
Totals	7,935,814 lbs.	2,609,501 lbs.

This to be credited:

	Contract No. 1.	Contract No. 2.
To Subway station work	......	2,479,617 lbs.
To Subway line work	......	994 "
To stock material	......	128,890 "
To extension, West Side Viaduct	7,619,863 lbs.	......
To "Z" bar protection to Subway curves	315,951 "	......
Totals	7,935,814 lbs.	2,609,501 lbs.

During 1906 there were made 2,894 tensile tests on structural material. These represent:

188 Heats on Contract No. 1.
1,295 Heats on Contract No. 2.

Of this total number of heats tested (1,483) on both contracts, 137 represent material not covered by regular specifications, on which a concession was made, 32 of which represent rivet, tie rod and anchor bolt material.

The results of all accepted tests on regular material show:

45.42 per cent., or 139 tests, giving an average minimum ultimate strength per square inch between 58,000 pounds and 60,500 pounds for Contract No. 1	59,202 pounds
39.60 per cent., or 716 tests, giving an average minimum ultimate strength per square inch between 58,000 pounds and 61,000 pounds for Contract No. 2	59,717 pounds
12.10 per cent., or 37 tests, giving an average maximum ultimate strength per square inch between 63,500 pounds and 66,000 pounds for Contract No. 1	64,500 pounds

12.72 per cent., or 230 tests, giving an average maximum ultimate strength per square inch between 65,000 pounds and 68,000 pounds for Contract No. 2	66,284 pounds
42.48 per cent., or 130 tests, giving an average ultimate strength per square inch, approximating the mean of the specification requirement (62,000 pounds) for Contract No. 1	61,872 pounds
47.68 per cent., or 862 tests, giving an average ultimate strength per square inch, approximating the mean of the specification requirement (63,000 pounds) for Contract No. 2	62,709 pounds

The average ultimate strength of all accepted regular material tests was:

For Contract No. 1	60,985 pounds
For Contract No. 2	61,977 pounds

The average elastic limit of all accepted regular material showed—For Contract No. 1, 40,279 pounds per square inch, as compared with specification minimum requirement of 33,000 pounds; and similarly, for Contract No. 2, 39,304 pounds per square inch, as compared with specification minimum requirement of 35,000 pounds.

The average elongation of all accepted regular material showed—For Contract No. 1, 28.82 per cent., as compared with specification minimum requirement of 20 per cent.; and for Contract No. 2, 28.54 per cent., as compared with specification minimum requirement of 22 per cent.

The average reduction of area of all accepted regular material showed—For Contract No. 1, 54.40 per cent., and for Contract No. 2, 53.25 per cent., as compared with specification minimum requirement of 44 per cent.

Records of inspection show:

	Contract No. 1.	Contract No. 2.
Heats originally rejected	31	324
Heats on retests rejected	..	38
Heats on retests accepted	5	29

Of the foregoing total rejected heats for Contract No. 1, 25 were rejected on physical tests alone, 24 of which were submitted by the Carnegie Steel Company, and one was material tested from the stock yard of the Brooklyn plant of the American Bridge Company. Five were rejected on chemical tests alone, 4 of which were submitted by the Carnegie Steel Company, and one by the Pencoyd Iron Works. One heat submitted by the Pencoyd Iron Works was rejected because material could not be identified.

Of the total rejected heats for Contract No. 2, 279 were rejected on physical tests alone, of which 262 were submitted by the Carnegie Steel Company, 16 by the Pencoyd Iron Works, and one was material tested from the stock yard of the Brooklyn plant of the American Bridge Company. Twenty-four were rejected on chemical tests alone, 13 of which were submitted by the Carnegie Steel Company, and 11 by the Pencoyd Iron Works. Three heats submitted by the Carnegie Steel Company were rejected on both physical and chemical tests, and 18 heats submitted by the Carnegie Steel Company were rejected on account of excessive weight of finished material, as incompatible with good mill practice.

Average results of all accepted material, rolled steel, during year periods, follow:

CONTRACT NO. 1.

Year.	Tonnage.	Heats Accepted.	Tons Represented.	Ultimate Strength, Pounds.	Elastic Limit, Pounds.	Per Cent. Elongation.	Per Cent. Reduction.
1900	16,512	1,205	13.7	61,720	38,630	28.9	55.7
1901	21,836	2,902	7.5	61,660	38,130	28.2	53.4
1902	13,315	1,977	6.7	61,230	38,070	28.2	54.5
1903	20,163	2,153	9.4	61,651	38,240	25.8	52.6
1904	3,305	738	4.5	61,610	38,980	28.3	55.0
1905	2,406	492	4.9	61,419	38,875	28.2	54.2
1906	6,127	550	11.1	60.985	40,279	28.8	54.4
Average........................				61,468	38,743	28.05	54.25
Specification requirement, 58,000 to 66,000 pounds....................				62,000	33,000	20.0	40.0

CONTRACT NO. 2.

Year.	Tonnage.	Heats Accepted.	Tons Represented.	Ultimate Strength, Pounds.	Elastic Limit, Pounds.	Per Cent. Elongation.	Per Cent. Reduction.
1903	3,582	375	9.6	61,880	38,480	27.8	52.9
1904	1,875	311	6.0	61,770	38,880	28.3	54.0
1905	2,069	325	6.4	61,462	39,332	28.6	54.1
1906	4,931	578	8.5	61,977	39,304	28.5	53.3
Average..........................				61,772	38,999	28.3	53.6
Specification requirement, 58,000 to 68,000 pounds....................				63,000	35,000	22.0	44.0

Following detailed records show inspection of above material by similar year periods:

CONTRACT NO. 1.

Year	Heats.			Rejected Acct. of Physical Tests.	Rejected Acct. of Chemical Analyses.	Rejected Acct. Both Physical Tests and Chemical Analyses.	Rejected Acct. of Overweight.	Per Cent.	Chemical Analyses.
	No. Tested.	No. Accepted.	Net Total Rejected.						
1900	1,269	1,205	64	26	38	..	..	5.0	232
1901	3,033	2,902	131	71	58	2	..	4.3	3,001
1902	2,241	1,977	264	200	58	6	..	11.8	2,357
1903	2,419	2,153	266	170	75	21	..	11.0	3,152
1904	817	738	79	61	13	5	..	9.7	738
1905	605	492	113	101	10	2	..	18.7	659
1906	662	550	112	91	10	1	10	17.0	766

CONTRACT NO. 2.

Year	Heats.			Rejected Acct. of Physical Tests.	Rejected Acct. of Chemical Analyses.	Rejected Acct. Both Physical Tests and Chemical Analyses.	Rejected Acct. of Overweight.	Per Cent.	Chemical Analyses.
	No. Tested.	No. Accepted.	Net Total Rejected.						
1903	424	375	49	41	6	2	..	11.6	1,132
1904	358	311	47	36	10	1	..	13.1	407
1905	396	325	71	65	5	1	..	17.9	378
1906	820	578	242	213	19	2	8	29.5	878

During 1906 there were made 44 tensile tests on iron-bolt material for East River Tunnel work, showing an average ultimate strength of 52,029 pounds; an average elastic limit of 32,470 pounds; an average elongation of 26.40 per cent., and an average reduction of area of 38.50 per cent. These tests represent a tonnage of 338,412 pounds.

The total weight of finished material shipped from the shop since commencing work amounts to 156,543,452 pounds for Contract No. 1, and 22,221,681 pounds for Contract No. 2; the weight accepted during 1906 being 5,154,091 pounds for Contract No. 1, and 8,361,958 pounds for Contract No. 2. The latter was manufactured at the following shops:

	Contract No. 1.	Contract No. 2.
Pencoyd branch	1,164,416 lbs.	41,220 lbs.
Trenton branch	1,219,942 "	3,308,266 "
Athens branch	2,704,936 "	4,636,704 "
Brooklyn branch	64,797 "	3,312 "
Ambridge branch	......	23,624 "
Baltimore Bridge Co.	......	348,832 "
Totals	5,154,091 lbs.	8,361,958 lbs.

The following list shows some of the most important instances of errors in shop work corrected through inspection:

Number of errors in faced length of columns, beams and girders	8
Number of pieces cut apart and reriveted	937
Number of pieces chipped, coped and reamed	864
Number of pieces of finished work restraightened	10
Number of pieces of finished work finally rejected	68
Number of holes screw-plugged on account of mispunching	191
Number of holes changed for field connections	68
Number of holes omitted and drilled later	49
Number of connections reset	98
Number of pieces of material omitted by shop	2

A comparison between actual shipped weights and estimated weights of material on all drawings on which work has been completed to date shows:

	Contract No. 1.	Contract No. 2.
Shipped weight of	145,209,592 lbs.	19,179,044 lbs.
Estimated weight of	144,407,447 "	18,998,625 "

These totals thus indicate an average excess in weight of only .055 of one per cent. for Contract No. 1, and .094 of one per cent. for Contract No. 2, the allowed specification variation being 2.5 per cent. deficiency.

During 1906 cast-iron material furnished consisted principally of segments for the East River Tunnel, with columns for the Hoyt street station, Contract No. 2; and some manhole frames and covers were furnished for Contract No. 1.

The total weight of cast material, excepting some drawbridge material, accepted and shipped since the beginning of work, amounts to 80,623,297 pounds. The weight for Contract No. 1, shipped during 1906, was 136,519 pounds, and for Contract No. 2, 11,039,045 pounds, a total of 11,175,564. This was cast at the following foundries:

	Contract No. 1.	Contract No. 2.
Foran Foundry and Machine Company	136,519 lbs.	55,821 lbs.
Davies & Thomas Company	......	10,983,224 "
Totals	136,519 lbs.	11,039,045 lbs.

In addition to the above amount of cast-iron accepted during 1906, 446,360 pounds were rejected, solely on account of imperfections in the workmanship.

Two hundred and seventy-two tensile tests were made, showing an average ultimate strength of 20,582 pounds per square inch, the specification minimum requirement being 18,000 pounds per square inch.

Five hundred and thirty-four transverse tests showed under specification conditions an average sustaining capacity per square inch at moment of rupture of 782 pounds, the minimum requirement being 750 pounds.

The total amount of cement shipped since the commencement of work amounts to 454,215,260 pounds; the amount shipped during 1906 being 31,162,565 pounds. The latter was divided as follows:

	Contract No. 1.	Contract No. 2.
82,006 ¾ barrels of Portland Cement	6,407,655 lbs.	24,754,910 lbs.

The total amount of Portland cement accepted during 1906 was 82,006 ¾ barrels, divided as follows:

American Giant	70,817 ¾	barrels,	37	lots
Lehigh	4,090	"	3	"
Helderburg	3,099	"	2	"
Alpha	2,000	"	2	"
Vulcanite	2,000	"	2	"

The average results from complete tests of 46 accepted lots of Portland cement, of 1,783 barrels each, show:

For Neat Briquettes.	24 Hours.	7 Days.	28 Days.
Average results, American Giant	320 lbs.	706 lbs.	796 lbs.
" " Lehigh	342 "	738 "	839 "
" " Helderburg	287 "	655 "	785 "
" " Alpha	295 "	736 "	831 "
" " Vulcanite	173 "	750 "	826 "
Specification requirements	150 "	400 "	500 "

For Sand Briquettes 2 to 1.	7 Days.	28 Days.
Average results, American Giant	392 lbs.	508 lbs.
" " Lehigh	371 "	495 "
" " Helderburg	370 "	523 "
" " Alpha	394 "	489 "
" " Vulcanite	375 "	521 "
Specification requirements	200 "	300 "

Results obtained are shown below, covering percentage of gain. both neat and in sand mixtures, as well as the average results of boiling tests of all accepted cement for 1906:

	Per Cent. Increase, 7 to 28 Days.		Average Strength of Boiled Briquettes.
	Neat.	Sand.	
American Giant	12.7	29.6	697 lbs.
Lehigh	13.7	33.4	649 "
Helderburg	19.8	41.4	760 "
Alpha	12.9	24.1	736 "
Vulcanite	10.1	38.9	788 "

During 1906 there have been broken of neat Portland cement 10,282 briquettes, of which 28 failed. Of Portland cement with sand, 8,511 briquettes, of which 17 failed. Total number of all briquettes, neat and sand, 18,793.

Average results of all accepted cement during year periods follow:

NEAT.

	1 Day.	7 Days.	28 Days.
1900	229 lbs.	582 lbs.	714 lbs.
1901	300 "	645 "	763 "
1902	317 "	703 "	800 "
1903	309 "	745 "	854 "
1904	294 "	700 "	786 "
1905	284 "	678 "	773 "
1906	313 "	709 "	801 "

SAND 2 TO 1.

	7 Days.	28 Days.
1900	276 lbs.	434 lbs.
1901	380 "	525 "
1902	419 "	545 "
1903	423 "	529 "
1904	408 "	509 "
1905	411 "	528 "
1906	389 "	508 "

The total amount of Portland cement inspected during the year amounted to 116,506 ¾ barrels, of which 82,006 ¾ barrels were accepted and 33,000 barrels rejected, while 1,500 barrels were turned over to the manufacturer on account of high seven-day neat results.

No natural cement was inspected during 1906.

The following tables show average strength of various brands of Portland cement at different periods up to four years, aggregating 1,195,000 barrels accepted:

NEAT.

	1 Day.	7 Days.	28 Days.	3 Mos.	6 Mos.
Average results to Dec. 31, 1906...	298 lbs.	687 lbs.	798 lbs.	801 lbs.	798 lbs.
		1 Year.	2 Years.	3 Years.	4 Years.
Average results to Dec. 31, 1906............		806 lbs.	796 lbs.	785 lbs.	784 lbs.

Average gain at 28 days, 16.2 per cent.

SAND 2 TO 1.

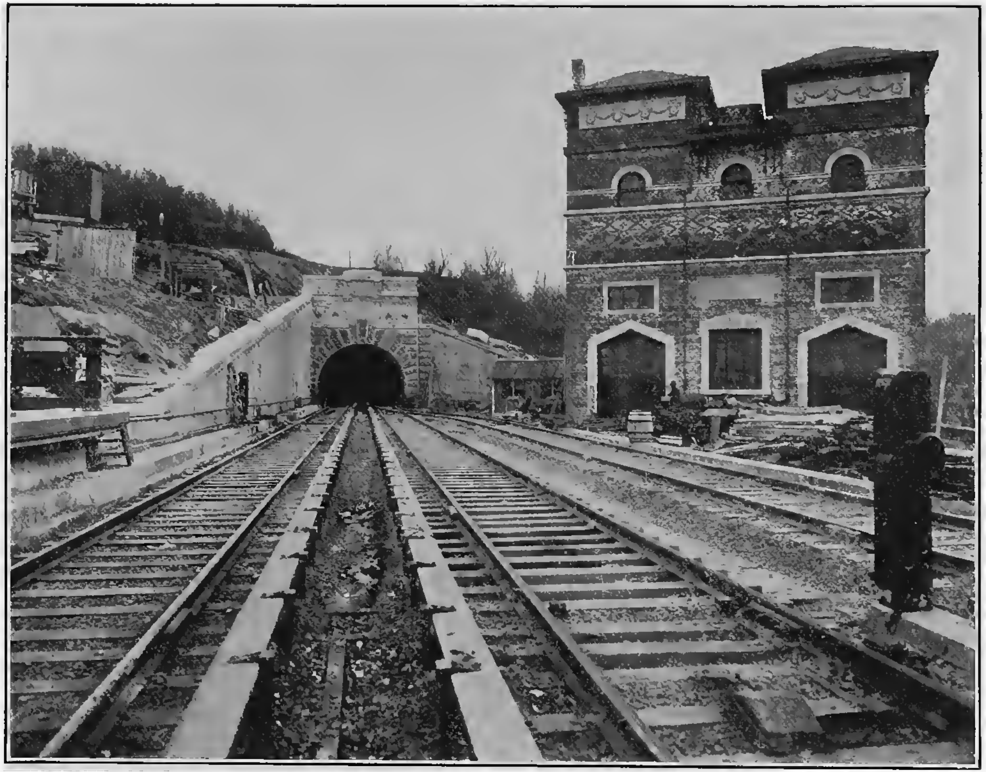
	7 Days.	28 Days.	3 Mos.	6 Mos.
Average results to Dec. 31, 1906............	403 lbs.	525 lbs.	569 lbs.	546 lbs.
	1 Year.	2 Years.	3 Years.	4 Years.
Average results to Dec. 31, 1906............	528 lbs.	488 lbs.	465 lbs.	500 lbs.

Average gained at 28 days, 30.2 per cent

Appended tables show similar records, at four-year period, on 51,713 barrels of natural cement, accepted for use on certain parts of the work:

NEAT.

	7 Days.	28 Days.	3 Mos.	6 Mos.
Average results to Dec. 31, 1906............	221 lbs.	319 lbs.	410 lbs.	471 lbs.
	1 Year.	2 Years.	3 Years.	4 Years.
Average results to Dec. 31, 1906............	494 lbs.	484 lbs.	488 lbs.	520 lbs.



SUB-STATION NO. 17, AT FORT GEORGE PORTAL.

SAND 1 TO 1.

	7 Days.	28 Days.	3 Mos.	6 Mos.
Average results to Dec. 31, 1906...........	219 lbs.	338 lbs.	494 lbs.	613 lbs.
	1 Year.	2 Years.	3 Years.	4 Years.
Average results to Dec. 31, 1906...........	649 lbs.	686 lbs.	740 lbs.	765 lbs.

The work accomplished by the chemical laboratory of the Department was:

Number of steel analyses made on ladle samples, Contract No. 1	40
Number of steel analyses made on finished material, Contract No. 1....................................	683
Number of steel analyses made on ladle samples, Contract No. 2	32
Number of steel analyses made on finished material, Contract No. 2....................................	846
Number of paint samples analyzed.....................	15
Number of oil samples analyzed.......................	1
Number of asphalt samples analyzed....................	9
Number of cement samples analyzed..................	93
Number of mastic samples analyzed....................	2
Number of waterproofing felt samples analyzed..........	2
Number of special determinations (Steel Contract No. 1).	43
Total	1,766

EQUIPMENT.

During the year 1906 no material change has occurred in the car equipment or in the power equipment for the operation of the subway.

The requirements of the service operated have led to a change in the location of one or two of the converter units for the power sub-stations. Table subjoined shows the various sub-stations operated, with the number of converter units as now provided:

Sub-Station.	Location.	Intervening Distance.	Converter Units.	
			Installed.	Provision for.
11	City Hall place...........	....	6	7
12	East Nineteenth street.....	1.89 miles between Nos. 11 and 12	5	7
13	West Fifty-third street....	2.19 miles between Nos. 12 and 13	7	9
14	West Ninety-sixth street...	2.30 miles between Nos. 13 and 14	7	7
15	West One Hundred and Forty-third street	2.37 miles between Nos. 14 and 15	4	7
16	West One Hundred and Thirty-second street	2.34 miles between Nos. 14 and 16	5	7
17	Hillside avenue, near Eleventh avenue	2.73 miles between Nos. 15 and 17	4	7
18	Simpson street, near Westchester avenue	3.06 miles between Nos. 16 and 18	4	7
21	Willow place, near Joralemon street	2.01 miles between Nos. 11 and 21	..	..

The converters for sub-station No. 21 have not yet been installed. The building, however, is completed, and the electrical equipment is now being installed.

During the year 1906 approximately 2½ miles of 2,000,000 c. m. lead covered cable was installed in sub-station No. 11, South Ferry, to improve the service at the southern extremity of the system in operation, by increasing the potential available at that point.

The installation of additional high potential cables for the Brooklyn extension was also begun during the year.

PASSENGER CHART.

Statement Showing the Number of Passengers Carried from each Station of the Subway during the Months of January, 1906, to December, 1906 both inclusive.

	January.	February.	March.	April.	May.	June.	July.	August.	September.	October.	November.	December.
City Hall	70,720	60,500	66,970	62,700	57,229	47,759	40,284	38,025	43,369	58,467	62,786	70,205
Brooklyn Bridge	1,729,660	1,581,700	1,761,270	1,716,430	1,706,504	1,496,653	1,369,506	1,281,715	1,471,572	1,760,840	1,803,730	1,915,671
Worth Street	151,063	136,024	157,755	138,265	128,912	105,738	88,833	87,532	93,499	136,327	138,819	156,182
Canal Street	224,818	205,105	237,120	214,665	200,647	161,022	133,145	133,209	145,924	210,212	212,730	225,142
Spring Street	268,687	256,008	295,520	263,105	244,378	196,275	163,839	166,399	182,549	267,643	274,538	293,310
Bleecker Street	279,970	266,900	307,100	277,400	256,554	202,993	171,687	177,938	188,581	270,165	275,976	283,977
Astor Place	432,990	402,370	458,840	415,300	371,289	290,431	217,650	208,468	259,037	414,105	443,045	546,256
Fourteenth Street	759,100	703,860	769,470	720,470	657,101	523,912	428,140	434,021	512,511	739,978	791,786	840,162
Eighteenth Street	296,410	274,000	317,010	281,820	249,983	194,519	154,574	153,767	183,568	277,918	284,849	330,103
Twenty-third Street	574,600	521,240	593,829	559,580	500,559	393,105	313,731	300,681	370,734	547,089	580,137	619,927
Twenty-eighth Street	292,350	256,660	293,820	280,320	230,329	168,558	130,916	127,005	160,843	257,127	287,853	311,410
Thirty-third Street	282,630	261,660	286,160	276,650	263,001	200,482	157,798	150,797	184,265	299,638	329,967	359,440
Grand Central	872,900	788,400	885,100	859,660	827,033	697,540	596,842	574,355	680,284	884,238	902,987	993,415
Times Square	705,000	668,300	695,250	629,950	563,337	414,243	334,941	333,758	427,881	629,967	716,429	757,909
Fiftieth Street	264,280	244,810	277,510	266,570	249,128	197,030	163,810	149,637	175,873	244,555	263,978	274,647
Columbus Circle	343,610	321,780	361,150	344,440	311,097	223,857	174,506	160,242	208,265	314,642	362,706	378,180
Sixty-sixth Street	208,140	195,900	212,780	189,240	181,164	139,987	107,162	102,326	123,562	193,500	206,361	224,304
Seventy-second Street	290,700	263,450	284,830	279,320	257,599	188,155	140,824	134,923	174,562	282,100	306,804	315,490
Seventy-ninth Street	191,310	173,190	187,380	182,070	184,374	122,541	86,045	81,609	104,391	168,321	189,581	203,865
Eighty-sixth Street	212,630	191,445	209,245	196,945	180,162	128,271	87,879	79,986	112,550	180,536	203,330	215,871
Ninety-first Street	116,480	106,890	115,140	109,220	100,294	70,682	50,431	46,406	61,748	99,347	110,354	120,078
Ninety-sixth Street	305,980	276,800	303,730	291,500	276,134	215,582	168,945	158,303	200,443	288,361	311,217	322,259
One Hundred and Third Street	261,900	237,900	259,300	247,100	222,650	166,362	131,177	121,127	152,105	223,139	240,267	252,037
Cathedral Parkway	131,302	119,920	134,380	125,815	113,871	85,266	67,507	63,408	81,090	118,717	132,418	140,002
Columbia University	96,770	93,840	104,630	98,070	93,602	65,360	47,942	44,272	63,048	117,729	125,342	127,732
Manhattan Street	153,860	141,420	163,530	165,630	169,855	149,619	143,643	140,515	152,170	184,736	192,498	188,804
One Hundred and Thirty-seventh Street	83,735	79,751	96,133	97,219	97,954	85,383	73,365	75,427	100,251	151,181	168,838	183,036
One Hundred and Forty-fifth Street	176,442	161,494	176,433	166,501	156,316	126,941	105,573	97,557	120,647	171,193	185,317	194,331
One Hundred and Fifty-seventh Street	141,450	126,860	142,290	135,740	117,005	85,637	75,902	72,279	73,012	98,654	106,183	108,048
One Hundred and Sixty-eighth Street	Opened April.			26,520	63,653	45,180	58,643	60,435	52,269	51,405	61,703	68,664
One Hundred and Eighty-first Street	Opened May 30th, 1906.				2,321	44,452	47,168	46,986	52,514	71,969	78,485	79,454
Dyckman Street	Opened March 12th, 1906.		6,275	20,795	31,200	32,399	39,228	32,845	26,611	16,398	15,794	10,727
Two Hundred and Fifteenth Street			2,375	5,143	6,808	6,979	5,847	5,100	4,662	4,545	4,029	3,919
Two Hundred and Twenty-first Street			20,400	40,720	41,273	37,151	38,631	37,450	43,075	80,239	101,212	101,710
One Hundred and Tenth Street, Lenox Avenue	346,500	318,110	353,650	347,600	324,298	261,262	213,010	201,730	235,570	321,284	339,580	356,470
One Hundred and Sixteenth Street, Lenox Avenue	500,440	461,500	504,470	481,460	443,620	362,494	289,780	277,530	334,170	457,712	476,580	501,180
One Hundred and Twenty-fifth Street, Lenox Avenue	473,720	431,100	471,560	454,400	415,052	320,704	252,230	229,450	301,560	429,718	465,940	482,800
One Hundred and Thirty-fifth Street, Lenox Avenue	353,455	319,885	350,615	336,195	319,032	261,594	225,950	212,360	253,780	338,374	353,000	375,450
One Hundred and Forty-fifth Street, Lenox Avenue	83,430	73,510	82,590	84,020	78,860	63,144	45,780	44,340	50,570	68,536	73,500	76,280
Mott Avenue	41,450	39,170	46,480	46,800	47,392	44,490	42,950	43,460	47,860	56,286	56,180	59,850
North Third Avenue	227,130	206,980	224,830	221,230	206,216	176,942	161,090	157,670	178,380	223,096	234,540	252,070
Jackson Avenue	169,340	146,395	161,725	158,110	155,056	144,446	136,890	137,080	149,847	180,543	179,350	189,250
Prospect Avenue	198,240	174,190	196,548	198,656	194,102	178,122	166,090	162,440	186,770	231,070	237,360	248,025
Simpson Street	50,389	43,643	54,572	62,517	64,840	64,869	64,041	62,543	64,677	77,898	79,729	76,896
Freeman Street	119,318	105,902	119,695	119,220	115,757	106,932	99,122	95,938	104,594	130,611	131,655	137,285
One Hundred and Seventy-fourth Street	19,313	17,164	18,659	20,956	21,455	19,906	18,868	17,132	18,405	21,545	21,831	21,560
One Hundred and Seventy-seventh Street	65,610	57,350	59,560	69,360	73,470	66,864	60,820	55,350	59,530	72,918	73,570	74,170
One Hundred and Eightieth Street	61,180	56,850	62,640	90,190	103,868	96,452	97,645	92,735	106,180	89,374	86,122	67,318
Fulton Street	626,360	556,472	637,315	589,583	565,194	469,589	395,608	371,523	424,348	599,368	616,073	697,776
Wall Street	405,428	349,838	409,613	365,092	350,517	291,018	245,258	231,881	252,201	374,410	375,138	416,839
Bowling Green	143,100	126,510	146,560	131,240	133,442	123,778	111,533	108,557	109,636	136,362	138,318	153,138
South Ferry	169,350	160,190	183,960	198,600	201,762	179,250	185,496	166,400	170,649	191,162	194,306	192,341
Total, full months	13,973,240	12,762,936	14,238,708	13,633,582	12,924,928	10,541,920	8,928,275	8,546,622	10,036,192	13,815,248	14,604,821	15,594,965
Total, partial months	......	......	29,050	26,520	2,321	......	......	......	......	......	......	......
Sum Total for full and partial months	13,973,240	12,762,936	14,267,758	13,660,102	12,927,249	10,541,920	8,928,275	8,546,622	10,036,192	13,815,248	14,604,821	15,594,965
Miscellaneous (not sold at stations)	7,898	7,730	10,171	7,874	16,262	8,200	11,524	9,173	9,901	7,005	8,753	14,551
Sum Total, including miscellaneous	13,981,138	12,770,666	14,277,929	13,667,976	12,943,511	10,550,120	8,939,799	8,555,795	10,046,093	13,822,253	14,613,574	15,609,516

Grand Total from January 1, 1906, to December 31, 1906, inclusive, 149,778,370.

PASSENGER CHART.

from each Station of the Subway during the Months of January, 1906, to December, 1906, both inclusive.

arch.	April.	May.	June.	July.	August.	September.	October.	November.	December.
66,970	62,700	57,229	47,759	40,284	38,025	43,369	58,467	62,786	70,205
61,270	1,716,430	1,706,504	1,496,653	1,369,506	1,281,715	1,471,572	1,760,840	1,803,730	1,915,671
57,755	138,265	128,912	105,738	88,833	87,532	93,499	136,327	138,819	156,182
37,120	214,665	200,647	161,022	133,145	133,209	145,924	210,212	212,730	225,142
95,520	263,105	244,378	196,275	163,839	166,399	182,549	267,643	274,538	293,310
07,100	277,400	256,554	202,993	171,687	177,938	188,581	270,165	275,976	283,977
58,840	415,300	371,289	290,431	217,650	208,468	259,037	414,105	443,045	546,256
69,470	720,470	657,101	523,912	428,140	434,021	512,511	739,978	791,786	840,162
17,010	281,820	249,983	194,519	154,574	153,767	183,568	277,918	284,849	330,103
93,829	559,580	500,559	393,105	313,731	300,681	370,734	547,089	580,137	619,927
93,820	280,320	230,329	168,558	130,916	127,005	160,843	257,127	287,853	311,410
86,160	276,650	263,001	200,482	157,798	150,797	184,265	299,638	329,967	359,440
385,100	859,660	827,033	697,540	596,842	574,355	680,284	884,238	902,987	993,415
595,250	629,950	563,337	414,243	334,941	333,758	427,881	629,967	716,429	757,909
77,510	266,570	249,128	197,030	163,810	149,637	175,873	244,555	263,978	274,647
361,150	344,440	311,097	223,857	174,506	160,242	208,265	314,642	362,706	378,180
112,780	189,240	181,164	139,987	107,162	102,326	123,562	193,500	206,361	224,304
284,830	279,320	257,599	188,155	140,824	134,923	174,562	282,100	306,804	315,490
187,380	182,070	184,374	122,541	86,045	81,609	104,391	168,321	189,581	203,865
09,245	196,945	180,162	128,271	87,879	79,986	112,550	180,536	203,330	215,871
115,140	109,220	100,294	70,682	50,431	46,406	61,748	99,347	110,354	120,078
303,730	291,500	276,134	215,582	168,945	158,303	200,443	288,361	311,217	322,259
59,300	247,100	222,650	166,362	131,177	121,127	152,105	223,139	240,267	252,037
134,380	125,815	113,871	85,266	67,507	63,408	81,090	118,717	132,418	140,002
104,630	98,070	93,602	65,360	47,942	44,272	63,048	117,729	125,342	127,732
163,530	165,630	169,855	149,619	143,643	140,515	152,170	184,736	192,498	188,804
96,133	97,219	97,954	85,383	73,365	75,427	100,251	151,181	168,838	183,036
176,433	166,501	156,316	126,941	105,573	97,557	120,647	171,193	185,317	194,331
142,290	135,740	117,005	85,637	75,902	72,279	73,012	98,654	106,183	108,048
	26,520	63,653	45,180	58,643	60,435	52,269	51,405	61,703	68,664
		2,321	44,452	47,168	46,986	52,514	71,969	78,485	79,454
6,275	20,795	31,200	32,399	39,228	32,845	26,611	16,398	15,794	10,727
2,375	5,143	6,808	6,979	5,847	5,100	4,662	4,545	4,029	3,919
20,400	40,720	41,273	37,151	38,631	37,450	43,075	80,239	101,212	101,710
353,650	347,600	324,298	261,262	213,010	201,730	235,570	321,284	339,580	356,470
504,470	481,460	443,620	362,494	289,780	277,530	334,170	457,712	476,580	501,180
471,560	454,400	415,052	320,704	252,230	229,450	301,560	429,718	465,940	482,800
350,615	336,195	319,032	261,594	225,950	212,360	253,780	338,374	353,000	375,450
82,590	84,020	78,860	63,144	45,780	44,340	50,570	68,536	73,500	76,280
46,480	46,800	47,392	44,490	42,950	43,460	47,860	56,286	56,180	59,850
224,830	221,230	206,216	176,942	161,090	157,670	178,380	223,096	234,540	252,070
161,725	158,110	155,056	144,446	136,890	137,080	149,847	180,543	179,350	189,250
196,548	198,656	194,102	178,122	166,090	162,440	186,770	231,070	237,360	248,025
54,572	62,517	64,840	64,869	64,041	62,543	64,677	77,898	79,729	76,896
119,695	119,220	115,757	106,932	99,122	95,938	104,594	130,611	131,655	137,285
18,659	20,956	21,455	19,906	18,868	17,132	18,405	21,545	21,831	21,560
59,560	69,360	73,470	66,864	60,820	55,350	59,530	72,918	73,570	74,170
62,640	90,190	103,868	96,452	97,645	92,735	106,180	89,374	86,122	67,318
637,315	589,583	565,194	469,589	395,608	371,523	424,348	599,368	616,073	697,776
409,613	365,092	350,517	291,018	245,258	231,881	252,201	374,410	375,138	416,839
146,560	131,240	133,442	123,778	111,533	108,557	109,636	136,362	138,318	153,138
183,960	198,600	201,762	179,250	185,496	166,400	170,649	191,162	194,306	192,341
38,708	13,633,582	12,924,928	10,541,920	8,928,275	8,546,622	10,036,192	13,815,248	14,604,821	15,594,965
29,050	26,520	2,321	......	......	......	......	......	......	......
67,758	13,660,102	12,927,249	10,541,920	8,928,275	8,546,622	10,036,192	13,815,248	14,604,821	15,594,965
10,171	7,874	16,262	8,200	11,524	9,173	9,901	7,005	8,753	14,551
77,929	13,667,976	12,943,511	10,550,120	8,939,799	8,555,795	10,046,093	13,822,253	14,613,574	15,609,516

78,370.

PASSENGER TRAFFIC.

The total number of passengers carried in the subway during the year 1906, as indicated by the ticket sales, was 149,778,370; an increase of about 29 per cent. over 1905. The yearly variation in subway passenger traffic is shown on Chart "A."

The smallest number of passengers carried in any one month was 8,555,795 during August; the largest number was 15,609,516 during December.

The months of minimum and maximum traffic during 1906 have shown increases of 41 and 14 per cent. respectively over the corresponding months, July and December, of 1905.

Referring to Chart "B" showing the monthly variation in traffic, it appears that the greatest increases through the year occurred during the first six months, when there was an average of 38 per cent. increase over the same six months of 1905.

The average number of passengers carried during a month in 1906 was 12,466,786.

Chart "C" shows graphically the annual distribution of the passengers at the various stations. The smallest travel occurred at the Two Hundred and Fifteenth street station on Broadway; the largest, at the Brooklyn Bridge station. Over nineteen and a half million people boarded trains at the Brooklyn Bridge station during the year; assuming that as many left the trains, over thirty-nine million people, exclusive of those transferring from one train to another, passed through the station. Twice as many use the Brooklyn Bridge station as any other single station on the road.

The ten busiest stations in the order of their importance are:—

1. Brooklyn Bridge,
2. Grand Central,
3. Fourteenth Street,
4. Times Square,
5. Fulton Street,
6. Twenty-third Street,
7. One Hundred and Sixteenth Street,
8. One Hundred and Twenty-fifth Street and Lenox Avenue,
9. Astor Place,
10. Wall Street.

The distribution of passengers over the different portions of the railroad was:

Location.	Number of Passengers.	Per Cent.
From South Ferry to Fulton street, inclusive............	14,372,082	9.6
From City Hall to 96th street, inclusive.................	92,930,238	62.0
From 103d street, Broadway, to 221st street, Broadway...	13,002,816	8.7
From 110th street, Lenox Ave., to 180th street, The Bronx	29,473.234	19.7
Total..	149,778,370	100.

The days of minimum and maximum traffic for the year were as follows:—

Minimum week day, August 11, 266,420 passengers carried.
Minimum Sunday, July 29, 159,146 passengers carried.

Maximum week day, December 24, 605,246 passengers carried.
Maximum Sunday, November 25, 324,037 passengers carried.

Chart "D" has been prepared to show the hourly variation in the ticket sales on the busiest day at the Brooklyn Bridge station, on December 8, when 76,867 tickets were sold.

For the purpose of studying the transit conditions in New York City more comprehensively, some general statistics have been compiled and represented graphically on charts herewith attached.

Chart S-1:—Shows the population of the city and its five boroughs from 1800 to 1905, as obtained from the United States and State censuses. Based upon the average rate of growth per decade from 1870 to 1900 the curves have been extended to 1930.

Chart S-2:—Indicates the paid passenger traffic in the city and its several boroughs, from 1901 to 1906, inclusive, from data obtained from various sources. The curves have been extended to 1916.

Chart S-3:—Shows the detailed variation in the traffic on the surface, elevated and subway lines for the same years as before.

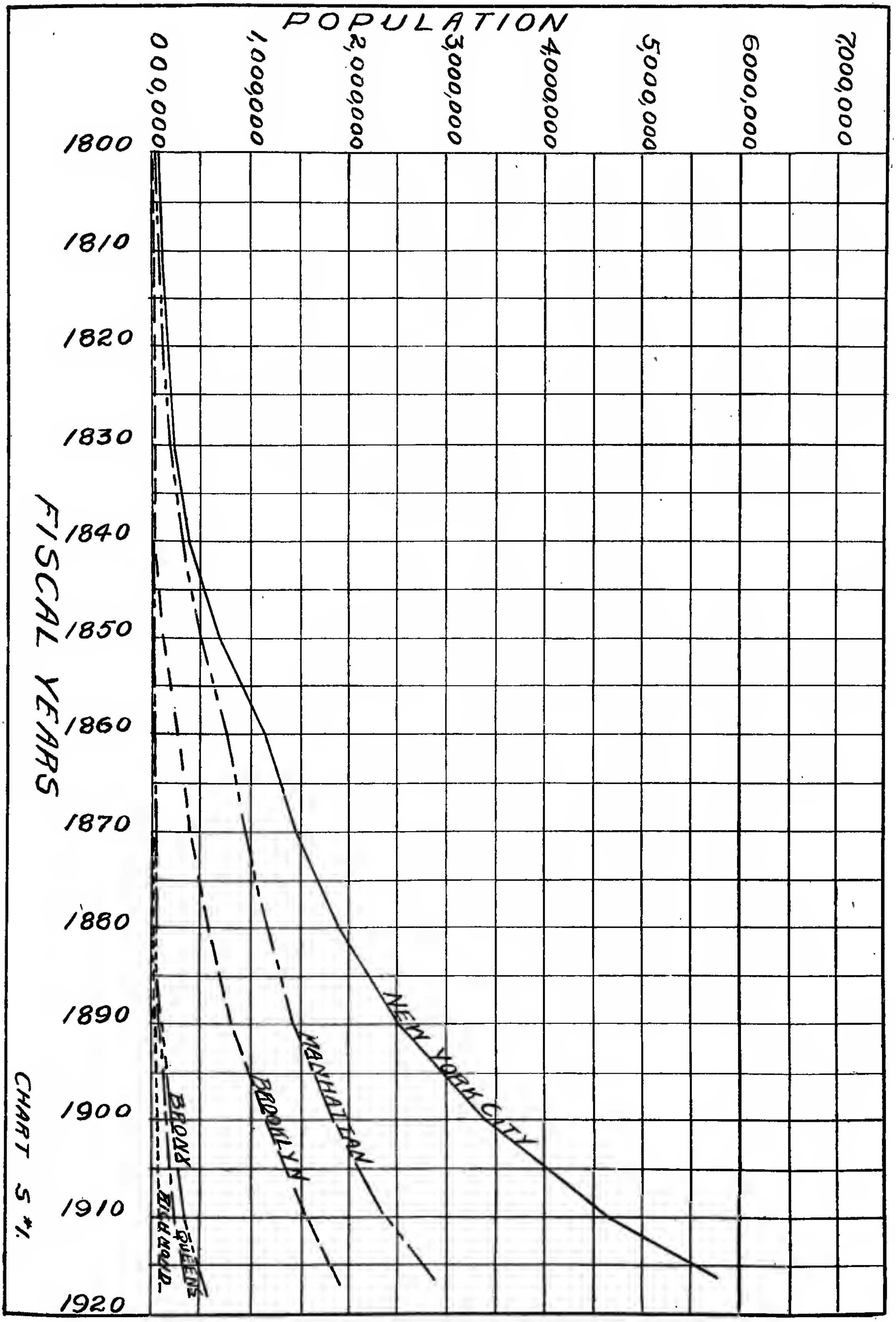
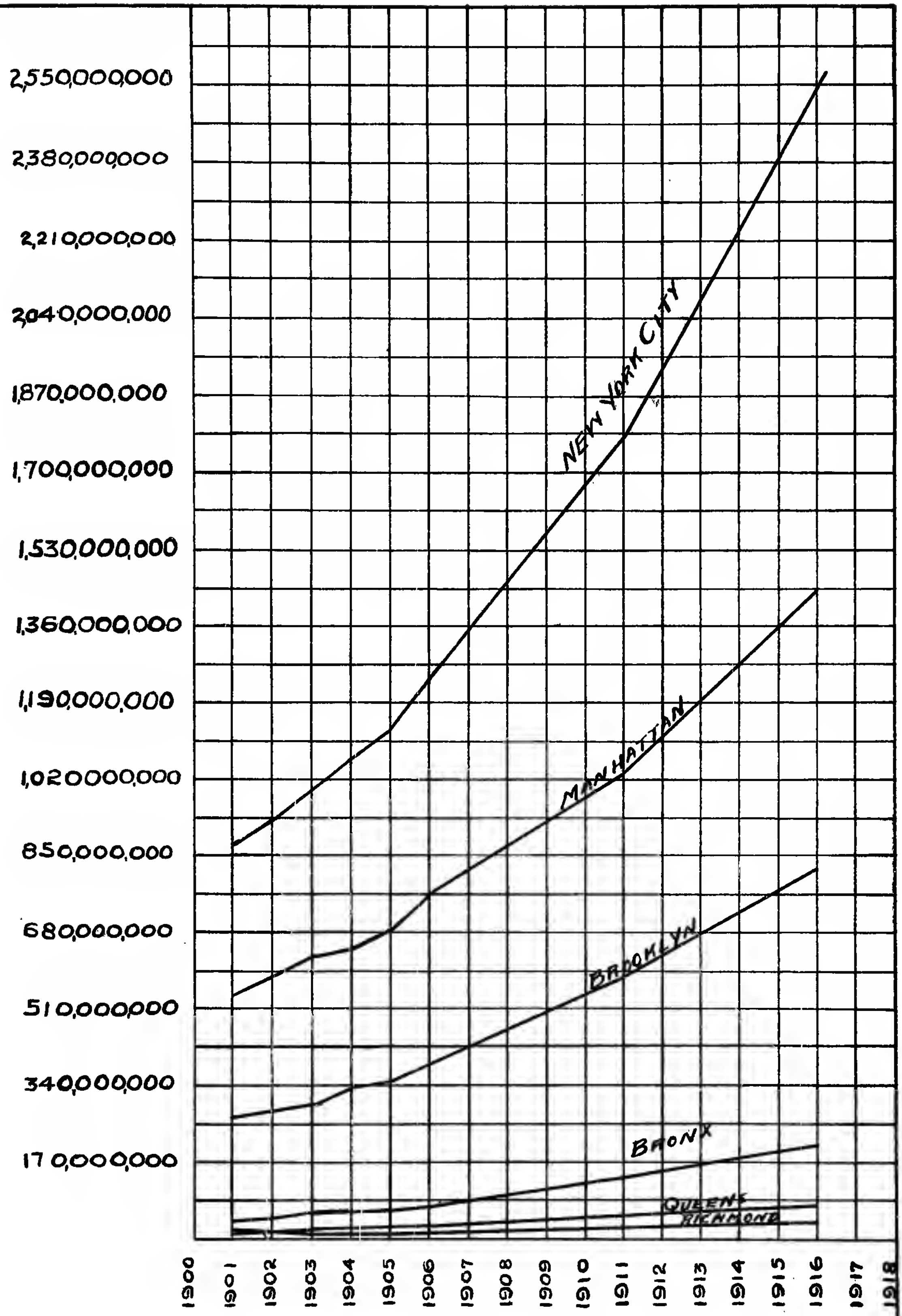


CHART 5 *1.

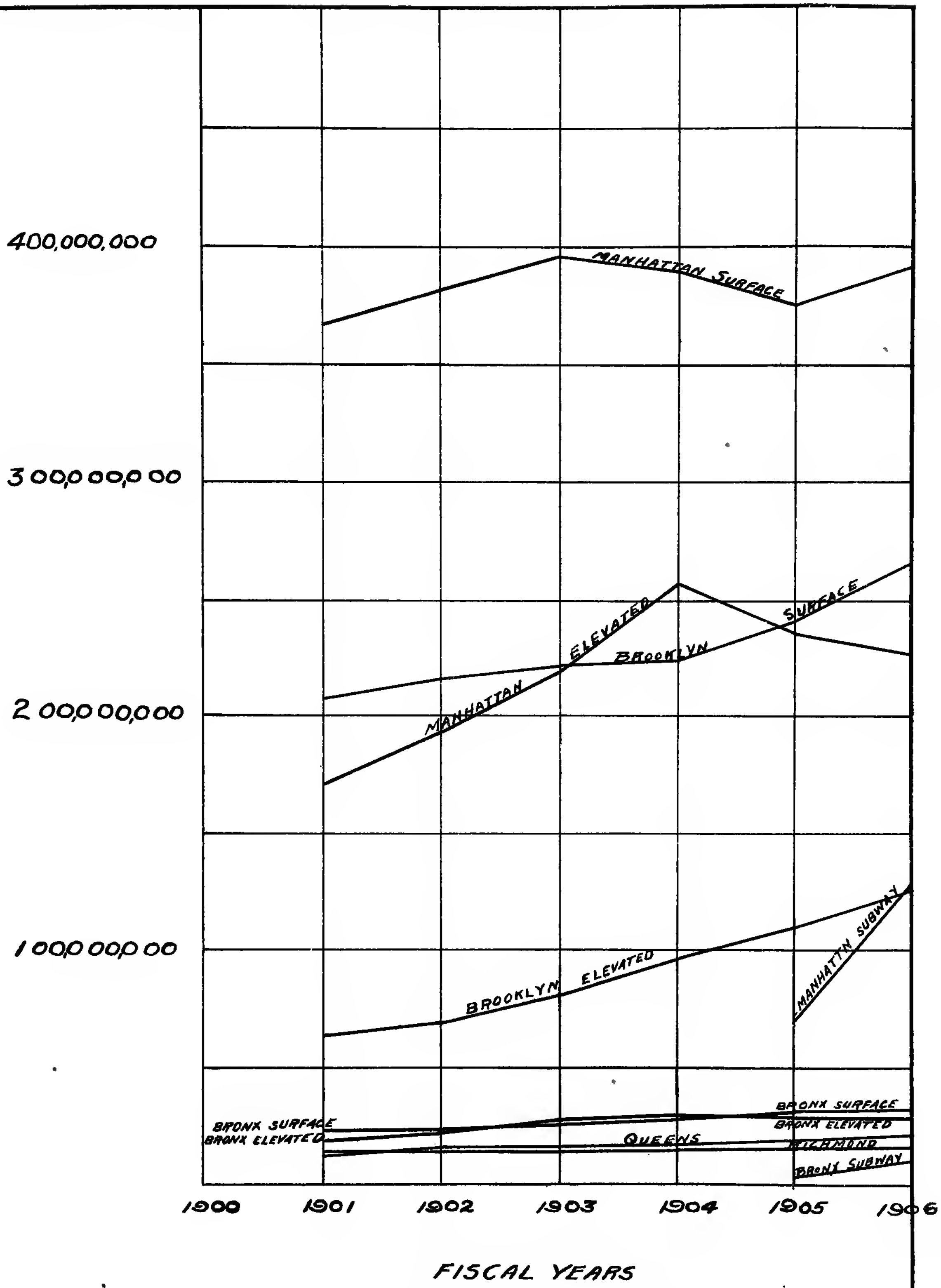
APPROVED
George S. Rice
CHIEF ENGINEER



PAID PASSENGERS

CHART S #2

APPROVED
George S. Rice
CHIEF ENGINEER.



PAID PASSENGERS

CHART S #3

APPROVED
George S. Rice
CHIEF ENGINEER.

The general laws governing the variations in the population and traffic of Greater New York can best be observed by studying Charts S-1 and S-2. Considering all the boroughs grouped into one great population centre, it appears that during the four years ending June 30, 1905, the total number of paid passengers traveling on all street railways—surface, elevated and subway roads—increased practically in a straight line, that is, the increment in each succeeding year was about the same. During 1906, however, there was a sudden marked increase in the traffic. While the average increment for the four preceding years was only about 63,000,000 per year, during 1906 it amounted to nearly 110,000,000. No census of the population of the Greater City was made in 1906. It is therefore impossible to determine whether this large additional number of riders is due to a corresponding increase in the population, or to an increase in the number of riders per capita, but an increase in the population is the most probable cause, as will appear later. The growth of the travel in the boroughs separately has not always been parallel with that in the whole city, as was notably the case during the last three years. During 1902 and 1903, the increases were practically uniform in each borough; the amount of increase in each borough being greater in the order of the size of population of the boroughs—that is, the increase was smallest in Richmond and largest in Manhattan.

During 1904 and 1905, with the travel in the whole city still increasing at a uniform rate, there was a loss in the rate of increase in the travel in Manhattan, and a corresponding gain in all the other boroughs, but mainly in Brooklyn. This may be accounted for by a temporary movement of some of Manhattan's population to the other boroughs. The only reason that can be ascribed for this migration was the interference with travel in Manhattan due to the buliding of the subway.

In 1906, when the notable increase in the number of paid passengers in the whole city occurred, there was a general increase in the rate of travel in all the boroughs. This was a greater rate than had prevailed during any of the preceding years which have been considered. Manhattan recovered more than was lost during the years 1904 and 1905. All the other boroughs made material gains.

In the upper portions of Manhattan, a territory which was not conveniently accessible before the subway was opened, a great many apartment buildings have been erected. There has been a large movement into this district, the subway stations located here alone have handled nearly 8,500,000 passengers during the fiscal year of 1906. Assuming that most of these people have come into the city from the outlying suburbs in New Jersey, Long Island and Westchester, a total of nearly 17,000,000 additional passenger fares are accounted for on the subway alone.

It would appear, therefore, as already stated above, that the pronounced growth in 1906, in the total number of paid passengers traveling in the whole city, can only be accounted for by a corresponding increase in the city's population. This is probably due to the operation of the city's first subway, a great many suburban people having been induced to come into the city in view of the increased facilities afforded. It is now proposed to take up each borough, more or less in detail, and finally to make some speculations with regard to the transportation requirements within the next decade.

In the borough of Richmond 15,571,889 paid passengers were carried during the fiscal year of 1906; 8,957,414 of these were carried on the surface lines, the remaining 6,614,475 on the steam roads; the daily average was nearly 43,000. During the last five fiscal years the number of passengers carried increased at a fairly uniform rate. The total increase for the five-year period was about 28 per cent. This borough now has on an average about two inhabitants to the acre. It is estimated that its population may be about 100,000 in 1916, or a little less than three to the acre. Approximately 60 per cent of all the passengers in Richmond, about 26,000 per day, are now transported to and from Manhattan by ferry. The increases in population and passengers transported will probably be greater than indicated above. However, assuming that the same rates are maintained, in 1916 there should be approximately 26,000,000 paid passengers carried in Richmond. About 15,000,000 of these will have to be provided with transportation to and from Manhattan. Each inhabitant of the borough now rides 210 times per year; in 1916 he would ride about 260 times. There are now 130 miles of single track operated in Richmond. The transportation problem here can be taken care of for many years to come by the natural expansion of the present systems to develop new territory and an increase in the car mileage to meet the added demands of the growing population.

In the borough of Queens the conditions are somewhat similar to those in Richmond, except that the population is larger and has increased about twice as fast.

In 1906 the population was 208,596. The completion of the tunnels now under construction will probably cause a phenomenal growth in the population. Based on a normal ratio of growth, however, it is estimated that it will be about 300,000 for 1916. In studying the traffic, the Long Island Railroad has not been included. There were 22,115,729 paid passengers riding on the surface lines during 1906, an increase of nearly 100 per cent. during the five fiscal years, as against the 28 per cent. increase in Richmond. The number of rides per inhabitant is smaller in this borough than in any other. In 1901 there were 73 per capita per year; in 1906, 106. If the traffic increases as rapidly during the next decade as it has during the past five years, in 1916 the travel in Queens borough will equal over 88,000,000 paid passengers. To carry this traffic within the borough, as was the case in Richmond, it will only be necessary to increase the car mileage as occasion demands, and to add to the trackage in undeveloped territory. This does not dispose of the passengers whose objective point is Manhattan; these must be provided with facilities for crossing the East river.

The statistics are not directly available from which the number of people bound to Manhattan can be determined. It has been estimated, however, that about 60 per cent. of the riding passengers both in Richmond and in Brooklyn cross to and from Manhattan each day. Using this same ratio, then about 53,000,000 people, exclusive of Long Island Railroad passengers, will have to be transported across the East river from Queens in 1916, either by ferries, bridges or tunnels.

The Blackwell's Island bridge and six tunnels are now being constructed between Manhattan and Queens. Two of the tunnels enter Manhattan at Forty-second street and are known as the Belmont tunnels; the other four are the Pennsylvania tunnels through Thirty-second and Thirty-third streets. The bridge provides for two elevated and two trolley tracks; in all there will be five tracks in each direction. The Pennsylvania tunnels will probably be used mostly by Long Island commuters. If these tracks are omitted from consideration three tracks in each direction will still be available for the use of this borough. These facilities should be in operation within four years. Their combined maximum capacity should be over 133,000,000 per year, with a maximum hourly capacity of over 73,000 in one direction. If all passengers are to be provided with seats then the above figures would become approximately 60,000,000 and 33,000, respectively. The residents of Queens will therefore have ample facilities for reaching Manhattan for many years to come.

During the fiscal year of 1906 389,555,025 paid passengers were carried on the street railways in the Brooklyn borough, a daily average of over 1,067,000. This represented 278 rides per inhabitant for the year.

The elevated lines carried 125,221,831 and the surface lines 264,333,194, or about 32 and 68 per cent., respectively, of the total number. Over 60 per cent., or approximately 234,000,000, of all of the above passengers were carried to and from Manhattan over the bridges and ferries. There has been a slight increase each successive year in the rate of increase of the total passengers carried. Considered separately, the riders have increased faster on the elevated than on the surface lines.

The number of surface riders in 1906 was about 27 per cent. greater than in 1901. During the same period the amount of single track operated has increased less than 2 per cent., and the car mileage only about 11 per cent. This has resulted in a greatly increased crowding on all lines. For the same five fiscal years the population has grown less than 18 per cent. Each inhabitant has taken 189 rides on the surface cars during 1906, as compared with 174 rides during 1901.

If the same rates of increase which have prevailed during the past five years are maintained for a decade, in 1911 the number of paid passengers carried on the surface roads in Brooklyn will amount to about 336,000,000; in 1916, to about 426,000.000.

These figures do not represent the maximum rates at which passengers will have to be carried during the rush hours. During these hours it is estimated that transportation will have to be provided on the surface lines at the rate of over 100,000 per hour in one direction in 1911, and 140,000 per hour in 1916.

The travel on the elevated railroads in Brooklyn has very nearly doubled, while the surface roads were gaining 27 per cent. To carry this enormous increase of traffic only 9.346 miles of single track have been added, or only 11 per cent. more than was operated in 1901. The car mileage during the same period has not increased 60 per cent. It appears, therefore, that the increase in facilities on the elevated railroads has not kept pace with the growth in the traffic. The whole transportation system, both surface and elevated roads, is greatly overburdened. It is obvious that in order to provide relief for Brooklyn's population the subway systems must be extended into and through the borough as quickly as possible. When this is done the surface lines will be greatly relieved; they can then be depended upon to fulfill their proper functions, that is, furnish the necessary short-haul service. Long-distance passengers will be provided for on the elevated and subway lines. The capacity of the present surface and elevated lines is about 280,000,000, if moderate crowding is permitted during the rush hours.

From careful estimates it is believed that not far from 560,000,000 paid passengers will have to be provided with transportation in Brooklyn on all lines during 1911, and 800,000,000 during 1916. Deducting the capacity of the present facilities, subways should be built by 1911 to accommodate 280,000,000 people, and by 1916 520,000,000 people.

To furnish this service with only moderate crowding, one four-track railroad operating ten-car trains should be completed across the East river and into Brooklyn within the next five years;

and one more within five years afterwards, or two altogether during the next decade.

If, however, all passengers are to be provided with seats during the rush hours new subways must be provided for 370,000,000 passengers by 1911, and 610,000,000 by 1916, or two four-track railroads must be constructed to Brooklyn within the next five years, and four within the next decade.

The population of the Bronx borough at the end of the fiscal year 1906 was 288,417. It has grown over 38 per cent. during the last five fiscal years. During the same period the number of paid passengers carried on the surface lines, or, it may be said, the travel within the borough, has increased at a uniform rate of more than 36 per cent. The corresponding increase in the passenger car mileage has been less than 27 per cent., consequently the service now provided is not as good as it was five years ago. The trackage is sufficient, and adequate surface car transportation in this borough can be furnished for some years by increasing the car mileage or number of cars in use.

The elevated and subway traffic in the borough represents the travel to Manhattan. The number of paid passengers using the elevated road increased at a uniform rate up to 1904. The next year there was a very slight increase, due wholly to the opening of the West Farms branch of the subway, which had been in operation for seven months. In 1906 the use of the subway caused a falling off in the number of elevated passengers. Apparently the subway has had no effect upon the travel on the surface lines in The Bronx. Probably about 42,000,000 paid passengers will be carried on the surface lines in 1911, and 57,000,000 in 1916.

Manhattan's population was 2,167,585 for the 1906 fiscal year. This represented an increase of about 15 per cent. in five years. The traffic on all the lines in the borough has increased nearly 39 per cent. during the same time, but the growth has not been uniform throughout the whole period. The percentage of increase for each succeeding year was less than that for the preceding year up to 1905. For 1906, as already stated, there was a marked increase in the travel on all lines. While in each year the total travel has increased over that of the preceding year, the same thing cannot be said of the surface, elevated and subway lines when considered separately. During 1902 and 1903 there was a steady increase in the number of paid passengers carried on both the surface and elevated roads. In 1904 there was a falling off on the surface lines and a corresponding increase on the elevated lines. This was probably due almost entirely to the interference with the surface cars caused by the construction of the subway. But the surface and elevated lines showed a loss in 1905, which combined was equivalent to the travel on the subway during that year. Most of the subway passengers, however, were drawn from the elevated lines. There were nearly 21,000,000 less passengers using the elevated than in 1904—a loss of 10 per cent., instead of what should have been a gain of nearly 20 per cent., due to the subway travel. During 1906 the surface roads gained a little over the previous year, but the elevated roads continued to lose passengers.

In the fiscal year of 1906 the surface cars in Manhattan carried 391,354,877 paid passengers. This was a total increase of about 7 per cent. in five years. It has already been shown that the population of the borough increased 15 per cent. during the same period. Each inhabitant rode 194 times during 1901, as compared with 181 times in 1906. It is therefore apparent that the public are not riding on the surface cars as often as formerly. There are several reasons for this. The subway traverses a section of the city which had not formerly been provided with rapid transit facilities; therefore, those who had been compelled before to use the surface cars immediately changed to the subway. Again, a great many have moved their homes from lower Manhattan into upper Manhattan and The Bronx, and in consequence have become patrons of the elevated and subway roads. The number of passengers carried in 1906 does not represent the maximum number carried per year during the last five years. In 1903 there were 396,570,435 surface car passengers, amounting to nearly 200 rides per capita. This was the summit year of the surface car travel. The changes in the trackage and car mileage have not corresponded with the variations in the traffic. The former has increased about 14 per cent., but the latter only about one-half of 1 per cent. The density of traffic, or number of paid passengers per car mile, has increased over 6 per cent.

At present, if there were greater facilities for the long-distance travel, the traffic on the surface lines would be materially less. The surface lines should be wholly available for the short hauls. If the traffic growth on these lines for the five years just past is maintained for a decade the paid passengers would then be about 419,000,000 in 1911, and 448,000,000 in 1916. This number can probably be taken care of on the present surface lines without excessive overcrowding, provided the street conditions are so regulated as to reduce to a minimum the obstruction to car movement, and the size of all the cars in service is increased to the dimensions of the largest cars now being used. It would be of great benefit if the movement of vehicles on the car tracks were prohibited, or at least restricted, particularly during the rush hours. Careful investigations made by the Merchants' Association during 1903 will confirm these statements.

It has already been pointed out that a large number of former patrons of the elevated changed to the subway as soon as it was opened. The elevated and subway roads in Manhattan are considered together, since they both provide for the long-distance travel. The combined traffic on the two systems during the fiscal year ending June 30, 1906, was 355,331,924 paid passengers, 227,538,369 riding on the elevated roads, and the remaining 127,793,555 using the subway. In five years the number of long distance riders has increased over 108 per cent. The number of such riders per inhabitant has been 91 for 1901, and 164 for 1906. The enormous gain indicated above was accompanied by a corresponding loss on the surface lines. It is unlikely that such an increase in the elevated and subway traffic will be maintained for more than a few years at the most; it merely represents a change from one system to another. The more nearly correct conditions will be shown in the increase in traffic on all lines. Moreover, since Manhattan and The Bronx are interconnected by both the elevated and subway lines, it will be desirable to consider these two boroughs together in arriving at any conclusion relative to the traffic on these two systems.

The population of Manhattan and The Bronx has been estimated at 2,456,002 for the fiscal year 1906. It will probably be about 2,740,000 in 1911, and 3,170,000 in 1916. The total paid traffic for the last five fiscal years has increased about 41 per cent., to 818,273,413 per year, or an average of about 2,242,000 per day. The number of rides per capita is now about 333. The above total paid passengers are distributed as follows: Surface lines, 422,567,025; Elevated lines, 257,786,756; Subway, 137,919,632. The surface lines carry about 52 per cent. of the total traffic, and the elevated and subway lines together the remaining 48 per cent. It appears, therefore, that at present in Manhattan and The Bronx the traffic is about equally divided between the surface roads in one case and the elevated and subway in the other, while in Brooklyn and Queens only about one-third of all passengers were carried on the elevated lines.

At the 41 per cent. rate of increase for five-year periods the total traffic in Manhattan and The Bronx will be about 1,153,000,000 in 1911 and 1,626,000,000 in 1916, daily averages of 3,131,000 and 4,454,800. Transportation must be provided for the rush hour conditions, or maximum number carried in one hour in one direction. The capacity of the existing elevated and subway roads, based on such conditions, if all passengers are to have seats, is not far from 200,000,000 per year; if moderate crowding is to be permitted, about 300,000,000. The estimated number of surface car riders has already been stated—for Manhattan, as 419,000,000 in 1911, and 448,000,000 in 1916; for The Bronx as 42,000,000 in 1911, and 57,000,000 in 1916. Deducting these figures and the estimated capacity of the existing elevated and subway lines from the total estimated traffic to be taken care of in 1911 and 1916, we have either, when seats are furnished, 492,000,000 and 921,000,000, or, with moderate crowding, 392,000,000 and 821,000,000 passengers, respectively, for whom transportation must be provided in new subways yet to be constructed.

Under moderate crowding two additional subways must be completed within five years and four within ten years. If seats are to be provided three additional four-track subways will have to be put in operation within the next five years, and three more within a decade, in order that the inhabitants of Manhattan and The Bronx may be transported to and from their daily business in comfort and decency.

NEW ROUTES AND EXTENSIONS.

The new routes and extensions adopted by the Board, described at length in the report of 1905, have entailed upon the engineering force an immense amount of work, in the making of surveys to cover the nineteen different routes adopted, and in completing the borings made for these routes begun in 1904, a detailed account of this work being given under a separate caption. Also the work of designing and preparing drawings, plans and specifications necessary in the preparatory work of letting contracts for construction has kept the Engineering Department sedulously employed since these new routes were first taken under consideration. Hearings held at stated times by the Commissioners appointed by the Appellate Division of the Supreme Court to pass upon such routes not receiving the consents of the majority of abutting property owners, required constant attendance by your Engineer, and much testimony to be given by him, necessitating voluminous data to be collated. All this necessary preliminary work having been well advanced by early Fall, the Board took active measures to get in form for contract letting such of these new routes considered most urgent to be constructed. What has been accomplished in this connection follows:

Connection Between Bridges, Elevated vs. Subway Loops.

The connection between the Williamsburg Bridge and the Brooklyn Bridge engaged the serious attention of the Board looking to the solution of the problem of the congestion at the Brooklyn bridges. On September 13, after a study of the question by your Engineer, he reported to the Board as follows:

New York, September 13, 1906.

Hon. A. E. Orr, *President, Rapid Transit Board:*

Dear Sir—In accordance with instructions of the Board I have investigated the proposed connection between the Williamsburg Bridge and the Brooklyn Bridge, with an idea of connecting them by an elevated railroad and also by a subway railroad, and beg leave to report as follows:

That better facilities for the distribution of passenger traffic are necessary at the ends of the Williamsburg Bridge, and also at the Brooklyn Bridge, than at present exist has long been apparent. The inadequate facilities afforded for crossing the East river have impeded the development and growth of the Borough of Brooklyn.

For many years this problem has been studied in connection with the rapid transit questions, and I have felt that the demand for better facilities in connection with Brooklyn is as urgent as any other rapid transit improvement in New York.

A connection by elevated railroad between the Manhattan ends of the Williamsburg and Brooklyn Bridges has been previously considered, both on Baxter street and also on Centre street, and I now report on an elevated railroad connection between the bridges, which, starting at the Williamsburg Bridge, passes through Delancey street to the Bowery, thence through the Bowery and Park row and North William street to the Brooklyn Bridge.

Careful surveys of the elevated structure as it exists along the Bowery and Park row have been made, and also designs for a structure to take care of the travel between the bridges, which, in my judgment, would be the most economical and practical. On Delancey street it is proposed to construct an elevated railroad with columns about 22 feet apart, near the curb of the parkway, occupying the centre of the street. Along the Bowery and on Park row it is preferable to reconstruct the Manhattan elevated structure which occupies these streets, instead of adding new columns between the existing ones, which would obstruct the streets to a larger extent than is now the case. The structure would be a double-deck one, carrying Manhattan tracks on the lower deck and the bridge loop tracks on the upper deck, it being designed so that the upper portion, with the columns above the level of the lower tracks, could be removed when occasion required. This would then leave a one-story structure along the Bowery and Park row carrying the Manhattan elevated tracks as at present.

With the plan submitted it is contemplated to have a station at the intersection of Delancey street and Allen street, which is one block from the elevated station of the Second Avenue Railroad, at the intersection of Allen street and Rivington street; also a station on the Bowery, at Grand street; another one at Canal street, and another at Chatham Square, which stations could conveniently connect with the present stations of the Third Avenue Elevated Railroad; also a station on Park row near Duane street, which would connect with the Brooklyn Bridge terminal.

The estimated cost of this elevated structure is about $1,800,000 for construction. The amount of damage to abutting property is an item not easily calculated, but the assessed valuation of the contiguous real estate is estimated at about $14,000,000. Taking 12½ per cent. of this as an approximate value of the damage caused along the whole route, the total cost of an elevated connection would be $3,550,000.

The elevated structure through Delancey street would be about forty feet above the elevation of the parkway, continuing about that elevation through the Bowery and Park row, and rising to a greater height near the Brooklyn Bridge. This, of course, necessitates at all stations escalators to connect the stations with the surface of the street.

Some studies have been made during the greater part of August in connection with the travel and the distribution of the people on the Manhattan side of the Brooklyn and the Williamsburg bridges. I find during the two morning and evening rush hours, from 7 to 9 a. m. and 5 to 7 p. m., respectively, that approximately an average of 20 per cent. of the people using the Brooklyn Bridge depart from or arrive at the Bridge entrance upon the subway, elevated and surface cars. The remaining 80 per cent. walk to and from the Bridge entrance. Of these latter 65 per cent. are from the districts to the east, south and west of the Bridge entrance. The remaining 15 per cent. come from the north through Park row and Centre street. These are the only people who would be accommodated by an elevated loop through the Bowery and Park row.

At the Williamsburg Bridge approximately 40 per cent. of all people using the Bridge in both directions cross it in the Metropolitan cars. Of the remaining 60 per cent., 25 per cent. would be accommodated by the above-mentioned loop. The other 35 per cent. come from territories north, south and east of the Bridge entrance.

This elevated loop could be built, after the necessary legal steps were taken, in one year from the time of letting the contract.

A subway connecting the Williamsburg and Brooklyn bridges would be made a part of the comprehensive system of subways as laid out by the Board, and as set forth in the Amended Final Report of the Board of May 12, 1905. Any part of the whole could be constructed as additional rapid transit facilities may be demanded by the increased traffic between the two Boroughs.

The subway system as laid out to provide for the Manhattan and Brooklyn interborough travel, with a number of stations along its route, as shown on the plans, has the advantage of distributing the passengers in both Boroughs and carrying them, within certain limits, to their destinations, instead of unloading them at one or at a few stations, a long distance from the final destination of the greatest number of the passengers, which naturally would cause a congestion of traffic at the few stations available.

In the plans submitted I show the subway lines forming a complete system of connections between the two bridges, and with provisions for future connections in the Borough of Manhattan, with additional routes between Manhattan and Brooklyn, namely, on Fourteenth street, Maiden lane, Old Slip, as well as at the Manhattan Bridge.

The route for Manhattan is laid out as follows:

Beginning at Williamsburg Bridge, it passes through Delancey street to Centre street, through Centre street to Brooklyn Bridge. Under Park row to William street, and through William street to the neighhorhood of Wall street. Also from Centre street and Grand street, through Grand street and Desbrosses street to Washington street, through Washington street and Liberty street to William street. Also from Centre street and Canal street, through Canal street to Wooster street, thence through Wooster street and Washington Square East, and University place to Fourteenth street, through Fourteenth street to Greenwich street, and through Greenwich street and Washington street to Desbrosses street.

The estimate for this portion of the subway route amounts to as follows:

BOROUGH OF MANHATTAN.

A four-track subway from the Williamsburg Bridge terminal, which is now under construction, to the Brooklyn Bridge	$3,400,000.00
Change of Brooklyn Bridge approach to connect to subway	750,000.00
A two-track subway from the Brooklyn Bridge through William street to a point north of and near Wall street	700,000.00
A two-track subway on Grand street and Desbrosses street, from Centre street to Washington street.	1,530,000.00
A two-track subway on Liberty street and Washington street, from William street to Desbrosses street	2,100,000.00
A two-track subway on Washington street, from Desbrosses street, through Greenwich street, Ninth avenue, Fourteenth street, University place, Washington Square East, Wooster street and Canal street to Centre street	5,600,000.00
Easements (estimated)	2,000,000.00
Total	$16,080,000.00

In Brooklyn, the plans submitted show a loop connection between the two bridges, with provision to connect with the future lines from Manhattan, as mentioned above. The route in Brooklyn is laid out as follows:

Beginning at Brooklyn Bridge, descending from the elevated tracks on the bridge, utilizing the bridge storage yard parallel with Washington street for the descent, it passes through Washington street to Fulton street; thence through Fulton street and Willoughby street and Flatbush avenue extension to Fulton street; through Fulton street to Lafayette avenue; through Lafayette avenue to Bedford avenue; through Bedford avenue and Bedford avenue extension, and across Williamsburg Bridge plaza to the Williamsburg Bridge.

The connection from the elevated tracks at the Brooklyn end of the Brooklyn Bridge to the subway on Fulton street is a new addition to the system, and was not included in the routes previously laid out by the Board.

The estimated cost of constructing the lines as described above is as follows:

BOROUGH OF BROOKLYN.

A two-track connection from the elevated tracks on the Williamsburg Bridge to the subway at the intersection of Bedford avenue and Broadway.	$420,000.00
A four-track subway on Bedford avenue and Bedford avenue extension, from Broadway to Lafayette avenue	2,520,000.00
A four-track subway on Lafayette avenue from Bedford avenue to Fulton street	2,050,000.00
A four-track subway on Fulton street from Lafayette avenue, through Flatbush avenue extension, Willoughby street and Fulton street to Myrtle avenue	1,830,000.00
A two-track connection from the subway at Myrtle avenue and Fulton street to the elevated tracks on the Brooklyn Bridge	410,000.00
Easements (estimated)	200,000.00
Total	$7,430,000.00

Any part or the whole of this subway, in both Manhattan and Brooklyn, can be constructed in two years after the time of letting the contracts.

I desire to call the attention of the Board to the fact that the greater part of this subway loop has been presented to the Appellate Division of the Supreme Court for its decision, in lieu of the consents of the property owners, and I expect that a decision will be rendered about the end of this year.

With this I submit three plans; one showing the proposed elevated loop; another the proposed subway loop, and one showing the assessed valuation along the proposed elevated loop.

The information furnished us in connection with the Brooklyn Bridge by Mr. C. M. Ingersoll, Chief Engineer of the Department of Bridges, has been of great value in the preparation of these plans, which courtesy I wish to acknowledge.

Very truly yours,
George S. Rice,
Chief Engineer.

Action was thereupon taken by the Board to decide whether an elevated loop or a system of subway loops would be the more feasible as a solution of this problem; and a public hearing, which was attended by large delegations of property owners and others, was given on October 18, after which the Board went into executive session and gave due consideration to the views expressed by those who addressed the meeting, and concluded to take definite action, to the end that the proposition of an elevated loop was put to a vote and acted upon adversely. At the following meeting, on October 25, the subject was reconsidered, and the elevated loop proposition again voted upon, with the same result, whereupon, by resolution duly adopted, the Chief Engineer and Counsel of the Board were directed to prepare plans and contract for the proposed subway connection. The consent and approval of the Board of Estimate and Apportionment to the route and general plans for this subway loop was requested on November 7 and obtained on November 23. Hearings had been held before the Commissioners appointed by the Appellate Division to pass upon and determine whether such route should be constructed, and by the end of the year these hearings were practically completed, and it is expected that the Commissioners of the Appellate Division will give their consent to the route and have their report confirmed by the Court at an early date, when the necessary preliminary steps can be hastened to let a contract for construction.

PROCEDURE PRELIMINARY TO LETTING CONTRACTS.

Sundry routes of those adopted by the Rapid Transit Board on May 12, 1905, were submitted, as expediency demanded, to the Board of Aldermen for approval as required by the Rapid Transit Act; and latterly all of them were submitted for like consent to the Board of Estimate and Apportionment, in accordance with an amendment to the Rapid Transit Act passed by the Legislature, vesting such power in that body instead of with the Board of Aldermen. On July 14, 1905, the Board of Estimate and Apportionment gave its consent, and the necessary hearings thereafter having been held, from time to time, before the Commissioners appointed by the Appellate Division, the Appellate Division in October, 1906, confirmed the Commissioners' report approving nine of these routes, conditionally upon the Rapid Transit Commissioners deciding within two years which of the routes they would finally conclude to construct. In view of this action, and to expedite construction of the routes considered most important, the Board of Estimate and Apportionment was asked by the Rapid Transit Board to give its opinion upon certain important factors in connection with letting contracts for these new routes, as set forth in the report of the Rapid Transit Railroad Commissioners. The Board of Estimate and Apportionment, having duly taken under advisement the questions involved in the communication submitted by the Rapid Transit Board, adopted a resolution on December 7, 1906, recommending that alternate bids be invited; first, for construction alone. and, secondly, for construction, equipment and operation of the following routes:

1. Seventh and Eighth avenue.
2. Lexington avenue route.
3. Third avenue route.
4. Jerome avenue subway.
5. Fourth avenue and Bensonhurst route.
6. The so-called tri-borough route south of One Hundred and Thirty-eighth street, in the borough of The Bronx, including in addition to the Third avenue route, Manhattan Bridge route, part of route 9-C in Brooklyn, part of route 11-E1 in Brooklyn, and route 11-A, 11-B and 11-F (Bensonhurst route) in the borough of Brooklyn.
7. West Farms and White Plains route.

Contracts were accordingly ordered to be prepared as soon as practicable for these several routes, more specifically described in the following memorandum, denoting them in numerical order, as well as by name, this numerical designation being given when officially adopted by the Board. The total length of route, and the estimated cost of each, according to figures prepared in 1905—not considering pipe galleries, and without including the cost of real estate to be acquired, and based on the prices of previous subway construction—are also given:

Route No. 3, Third Avenue Route.

Begins at South street, one branch through Broad street, Nassau street and Park Row to Chatham Square, and one branch through Pearl street and New Bowery to Chatham Square, and thence through the Bowery, Third avenue to the Harlem River. Thence one branch through Lincoln and Morris avenues to One Hundred and Forty-second street, and one through Southern Boulevard to St. Ann's avenue.

Total length of route, feet........................	68,300
Estimated cost	$26,500,000

Route No. 4, Seventh and Eighth Avenue Route.

Begins at Battery Park, through Greenwich street, one branch through Hudson street and Eighth avenue to One Hundred and Fifty-fourth street, and one branch through West Broadway, Greenwich avenue, and Seventh and Eighth avenues to One Hundred and Fifty-fourth street.

Total length of route, feet........................	80,200
Estimated cost	$35,500,000

Route No. 5, Lexington Avenue Route.

Begins at Battery Park, through Greenwich street, Trinity place, Vesey street, Broadway, Fifth avenue, Thirty-fifth and Thirty-sixth streets, Lexington avenue to the Harlem River. Thence three branches: Park avenue and One Hundred and Fifty-third street to One Hundred and Sixty-fourth street, Park avenue to One Hundred and Fifty-sixth street and Morris avenue to One Hundred and Forty-ninth street. Also spur connection from Lexington avenue to Park avenue through Forty-second street.

Total length of route, feet........................	70,450
Estimated cost	$30,000,000

Route No. 11, Fourth Avenue Route.

Fourth avenue, from Atlantic avenue to One Hundred and First street, in Brooklyn.

Total length of route, feet	39,550
Estimated cost	$12,750,000

Route No. 11-*F, Bensonhurst Route.*

From Fourth avenue, in Brooklyn, through Fortieth street, New Utrecht avenue, Eighty-sixth street and Stillwell avenue.

Total length of route, feet	32,500
Estimated cost	$10,000,000

Route No. 15, *Jerome Avenue Subway.*

From One Hundred and Sixty-second street, in The Bronx, to Jerome avenue.

Total length of route, feet	31,850
Estimated cost	$13,650,000

Route No. 18, *West Farms and White Plains Route.*

From One Hundred and Seventy-seventh street, in The Bronx, through West Farms Road and White Plains Road.

Total length of route, feet	28,000
Estimated cost	$3,500,000

Tri-Borough Route.

Westchester Turnpike and Southern Boulevard, in The Bronx, Route No. 3 (Third Avenue Route), in Manhattan, Manhattan Bridge and Fourth avenue to One Hundredth street, Brooklyn, and Fortieth street, New Utrecht avenue and Stillwell avenue, Brooklyn.

Total length of route, feet	172,000
Estimated cost	$55,200,000

Of the seven routes above described, it was deemed expedient to advertise first for bids for Route No. 5 (Lexington avenue route), and the necessary plans, contract and specifications for that route were practically advanced to completion by the end of the year to receive bids at the earliest possible date. Your Engineer concluded in the studies of this route that it would be as feasible to provide for a double-deck structure instead of the usual four-track mode of construction, as stated in the following letter addressed to the Board:

NEW YORK, December 13, 1906.

Hon. ALEXANDER E. ORR, *President, Rapid Transit Board:*

DEAR SIR—In making the final studies for the subway, Lexington avenue route, based on the results of the extended surveys that have been made since the general routes and plans were adopted by the Board, I have reached the conclusion, after mature consideration, that the best form of structure for this route is what may be termed a double-deck structure, that is, a structure having the local tracks near the street surface and the express tracks directly under the local tracks.

Furthermore, while still having these studies under consideration, it was determined by the Board that pipe galleries should be provided for all the rapid transit lines, and this has emphasized or added to the desirability of a double-deck structure on Lexington avenue.

Lexington avenue is 75 feet wide between building lines, with a general width of about 38 feet between the curbs. It is largely a residential street, and on a very large portion of it the main entrances to the buildings are above the sidewalk and are reached by flights of stairs from the sidewalk to the main floor.

To build the structure with four tracks substantially on the same level would necessitate the temporary removal of practically all of these stairways, iron railings and area enclosures that form a common feature of this residential district.

To depress the outside tracks to provide for pipe galleries would not change the above conditions, as in either case the sides of the excavation would be within about seven feet of the building lines, and in order to provide for the pipe galleries the additional depth necessary, so near the building lines, would necessitate the underpinning of the buildings, with all the possibilities of rather serious inconvenience to abutting owners.

With a double-deck construction, while the depth of excavation would be somewhat greater, the limits of the excavation for the railroad would be about at the curb line, with only the excavation for pipe galleries encroaching somewhat on the sidewalk area, these galleries having comparatively little depth.

Also, with a double-deck railway, the alignments and grades will be adjusted to the best advantage, and finally, all conditions considered, the double-deck structure, in my opinion, can be more economically built with the minimum inconvenience to abutting property owners.

In view of the above, I desire to recommend to the Board that the Chief Engineer be authorized or directed to prepare the final plans for the Lexington avenue route, that it shall in the main be constructed as a double-deck railway.

Very truly yours,
GEORGE S. RICE,
Chief Engineer.

The Board approved this form of construction, and directed that the detailed plans be prepared by the Chief Engineer to show in general a double-deck structure in Lexington avenue, with two of the tracks placed substantially under the others, at a depth not to exceed 20 feet below them.

LOCATIONS OF STATIONS FOR NEW ROUTES.

On December 27 plans to show locations of stations were submitted to the Board and duly approved, for the Lexington avenue route, the Seventh and Eighth avenue route, including the Jerome avenue subway, and the Third avenue route in Manhattan and Brooklyn, and part of the Bronx; these several routes, of the seven above referred to to be advertised for bids, having been ordered to be put under immediate contract.

The locations of these stations have been made with the view of improving the express service over that maintained on the present Rapid Transit Railroad, as the stations being farther apart permit of greater speed. The local stations being about nine or ten blocks apart, greater speed can also be made between these stations.

The stations as located are given in the following list:

Stations on Lexington Avenue Route.

Exchange alley-Rector street.
Cortlandt-Dey streets.

Cortlandt street.
Warren-Chambers streets (express),
Leonard-Franklin streets,
Grand-Broome streets,
Houston-Bleecker streets,
Eighth-Ninth streets,
Fourteenth street (express),
Twenty-second-Twenty-third streets,
Thirty-second-Thirty-third streets.
Thirty-seventh-Thirty-eighth streets,
Forty-third-Forty-fourth streets (express),
Fifty-first-Fifty-second streets,
Fifty-ninth-Sixtieth streets,
Sixty-eighth-Sixty-ninth streets,
Seventy-seventh-Seventy-eighth streets,
Eighty-sixth-Eighty-seventh streets (express),
Ninety-seventh-Ninety-eighth streets,
One hundred and fifth-One hundred and sixth streets,
One hundred and fifteenth-One hundred and sixteenth streets.
One hundred and twenty-fourth-One hundred and twenty-fifth streets (express),
One hundred and thirty-sixth-One hundred and thirty-seventh streets.
One hundred and fortieth street.
One hundred and forty-ninth street,
One hundred and fifty-sixth street,
Walton-Gerard avenues.
Jerome avenue,
One hundred and sixty-fourth street.

Stations on Third Avenue Route.

Whitehall street.

NASSAU STREET BRANCH—

Beaver street-Exchange place,

Fulton-Ann streets,

Chambers street.

PEARL STREET BRANCH—

Hanover square,
John-Fulton streets,
Frankfort street,
Chatham square (express),
Canal street,
Delancey street,
Houston-First streets,
Seventh-Eighth streets,
Fourteenth-Fifteenth streets,
Twenty-third-Twenty-fourth streets (express),
Thirty-third-Thirty-fourth streets,
Forty-first-Forty-second streets,
Fiftieth-Fifty-first streets,
Fifty-ninth-Sixtieth streets (express),
Sixty-seventh-Sixty-eighth streets,
Seventy-sixth-Seventy-seventh streets,
Eighty-sixth-Eighty-seventh streets (express),
Ninety-fifth-Ninety-sixth streets,
One hundred and fifth-One hundred and Sixth streets,
One hundred and fifteenth-One hundred and Sixteenth streets,
One hundred and twenty-fifth-One hundred and twenty-sixth streets (express),
One hundred and thirty-sixth-One hundred and thirty-seventh streets.

ONE HUNDRED AND THIRTY-SECOND STREET BRANCH—

Brook-St. Ann's avenues,

Stations on Fourth Avenue Route.

On Flatbush avenue (extension), between Lafayette street and DeKalb avenue.

On Fourth avenue, at Dean and Pacific streets (express).

On Fourth avenue, at Union and President streets.

On Fourth avenue, at Eighth and Ninth streets.

On Fourth avenue, at Prospect avenue and Seventeenth street.

On Fourth avenue, at Twenty-fifth and Twenty-sixth streets.

On Fourth avenue, between Thirty-fifth and Thirty-seventh streets (express).

On Fourth avenue, at Forty-seventh and Forty-eighth streets.

On Fourth avenue, at Fifty-sixth and Fifty-seventh streets.

On Fourth avenue, at Sixty-fifth and Sixty-sixth streets (express).

On Fourth avenue, at Seventy-fifth and Seventy-sixth streets.

On Fourth avenue, at Eighty-fifth and Eighty-sixth streets.

On Fourth avenue, at Ninety-third and Ninety-fourth streets.

On Fourth avenue, at One hundred and One hundred and first streets (express).

Stations on Bensonhurst Route.

On Fortieth street, at Seventh avenue.

On New Utrecht avenue, at Forty-third and Forty-fourth streets.

On New Utrecht avenue, at Fifty-first and Fifty-second streets.

On New Utrecht avenue, at Sixty-first and Sixty-second streets.

On New Utrecht avenue, at Sixty-eighth street and Bay Ridge avenue (express).

On New Utrecht avenue, at Seventy-eighth and Seventy-ninth streets.

On Eighty-sixth street, between Nineteenth avenue and Bay Twenty-third street.

On Eighty-sixth street, at Twenty-second avenue and Bay Thirty-first street (express).

On Eighty-sixth street, at Twenty-fifth avenue and Bay Fortieth street.

On Stillwell avenue, between Bay Fiftieth street and Cropsey avenue.

On Stillwell avenue, between Mermaid and Surf avenues (express).

Stations on Seventh and Eighth Avenue Route.

Battery Park,

Edgar-Rector streets,

Dey street,

Murray-Warren streets (express).

WEST BROADWAY BRANCH—
- Franklin-White streets,
- Broome-Spring streets,
- Bleecker-Third streets,
- Christopher street (express).

WEST BROADWAY BRANCH—
- Fourteenth-Fifteenth streets,
- Twenty-third-Twenty-fourth streets,
- Thirty-third-Thirty-fourth streets (express),
- Forty-first street,
- Forty-ninth-Fiftieth streets,
- Fifty-seventh-Fifty-eighth streets (express).

HUDSON STREET BRANCH—
- Harrison-Franklin streets,
- Canal street,
- King-West Houston streets,
- Christopher-West Tenth streets (express),
- Fourteenth-Fifteenth streets,
- Twenty-third-Twenty-fourth streets,
- Thirty-third-Thirty-fourth streets (express),
- Forty-first-Forty-second streets,
- Forty-ninth-Fiftieth streets,
- Fifty-seventh-Fifty-eighth streets (express),
- Sixty-seventh-Sixty-eighth streets,
- Seventy-sixth-Seventy-seventh streets,
- Eighty-sixth-Eighty-seventh streets (express),
- Ninety-fifth-Ninety-sixth streets,
- One hundred and fourth-One hundred and fifth streets,
- One hundred and fifteenth-One hundred and sixteenth streets,
- One hundred and twenty-fourth-One hundred and twenty-fifth streets (express),
- One hundred and thirty-fourth-One hundred and thirty-fifth streets,
- One hundred and forty-third-One hundred and forty-fourth streets,
- One hundred and forty-eighth-One hundred and forty-ninth streets (express).

One hundred and fifty-fourth street (express).
Woodycrest avenue,
One hundred and sixty-fifth-McClellan streets,
One hundred and Seventieth street,
One hundred and seventy-fourth street,
Tremont avenue.
One hundred and eighty-first street (express),
Fordham road,
Kingsbridge road,
Two hundredth street,
Mosholu parkway,
Woodlawn road (express).

PIPE GALLERIES.

The Rapid Transit Act provides that the Board may in its discretion include, in its plans and specifications for the construction of rapid transit railways, provision for pipe galleries. On December 3, the Board directed the Chief Engineer to prepare plans and specifications for the construction of pipe galleries in future subways wherever such galleries are possible of construction, and provision has been made for this in the plans for new subways where proper space will allow, leaving the question of actual construction for the future. In many of the new routes provision for such galleries will necessarily add to the expense of construction, as it will necessitate going to a greater depth than would otherwise be necessary.

SURVEYS, ETC., OF NEW ROUTES.

The proposed additional Rapid Transit routes approved by the Board, as computed from the surveys made of these routes, cover approximately 169.9 miles of railway, principally subways.

During the years 1904, 1905 and 1906 the different Division Engineers and their respective corps were more or less engaged in the large amount of field work required to be done in surveying and mapping these new routes. As this preliminary work was developed in different stages, it devolved upon the Chief Engineer, assisted by his entire office staff of engineers, to make studies for alignment to prepare maps, plans, structural drawings, etc.

The amount of work involved in the preparation of all this data to date is shown in the following table:

Year.	Base Line.		Bench Levels.		Field Topography.		Sub-Surface Indications.	
	Lin. Ft.	Miles.	Lin. Ft.	Miles.	Lin. Ft.	Miles.	Lin.Ft.	Miles.
1904	115,920	21.96	61,869	11.71	54,027	10.23	34,262	6.49
1905	527,474	99.90	413,432	78,30	197,924	37.48	387,182	73.33
1906	336,286	63.69	485,975	92.04	314,416	59.55	465,799	88.21
Totals............	979,680	185.55	961,276	182.05	566,367	107.26	887,243	168.03

Year.	A-Drawings. (Alignment.)		B-Drawings. (Sewers.)		D-Drawings.		E-Drawings.	
	Lin. Ft.	Miles.	Lin. Ft.	Miles.	Lin. Ft.	Miles.	Lin.Ft.	Miles.
1904	...	...	...	...	14,900	2.82	...	...
1905	340,126	64,42	...	...	108,757	20.60	...	...
1906	238,318	45.13	87,700	16.61	219,868	41.64	108,593	20.57
Totals............	578,444	109.55	87,700	16.61	343,525	65.06	108,593	20.57

BORINGS FOR NEW ROUTES.

In the report of 1905 details are given of test borings made along the lines of new rapid transit routes as laid out by the Board. At the close of the year 1905 work on the Healey Sewer Machine and Construction Company's contract for test borings was still in progress, unavoidable delays having prevented completion at the end of December; but on February 7, 1906, the work was finished.

Total value of work on this contract done in 1905 was	$26,951.19
Less 10 per cent, reserved as per contract..........	2,695.12
Amount certified for payment to December 31, 1905.	$24,256.07
The total value of the work as finally completed, February 7, 1906, was	33,525.87
Amount certified for payment during 1906.........	$9,269.80

The estimated linear feet of borings to be made under the contract, the number of linear feet actually completed, and the cost for each section in the total payment to the Contractor, are given below:

Section No.	Est. Lin. Ft.	Lin. Ft. Done During 1905.	Lin. Ft. Done During 1906.	Total Lin. Ft. Completed.	Contract Price, Per Lin. Ft.	Total Cost.
1—Land borings..	14,500	13,352.7	......	13,352.70	$0.50	$6,676.35
2— " " ..	11,000	11,150.0	1,434.32	12,584.32	0.50	6,292.16
3— " " ..	5,400	1,013.4	3,504.80	4,518.20	0.45	2,033.19
4— " " ..	16,000	5,667.0	6,963.00	12,630.00	0.45	5,683.50
5—River borings.	11,500	10,168.4	997.40	11,165.80	1.15	12,840.67
Totals.........	58,400	41,351.5	12,899.52	54,251.02	....	$33,525.87

Sections 1, 2, 3 and 4 comprised the work on land borings, and Section 5 the river borings. Of the former 1,660 borings were made, having a total depth of 43,085 linear feet, or an average depth of about 25.9 linear feet; of the river borings 148 were made, having a total depth of 11,165.8 linear feet, or an average depth of 75.5 linear feet.

After the rock surface was approximately determined on the lines crossing the rivers by the wash borings noted above, it was deemed advisable to verify this location, and also to determine the nature of the rock that would probably be encountered in the river tunnels. Additional routes had been laid out, namely, the Bensonhurst route, in the borough of Brooklyn, and the extension of the Westchester avenue route to Pelham Park, in the borough of The Bronx, for which wash borings were necessary; and investigations respecting the proposed removal of the tracks of the New York Central & Hudson River Railroad in Eleventh avenue and other streets on the west side of Manhattan, also required some additional wash borings. Consequently, to cover this work, on May 3 the President of the Board was authorized to obtain bids for making test borings with Diamond Drills on the river routes, and for wash borings on the other routes; and a few tests were also necessary to be made in Washington street, Brooklyn. Bids for this work were received and opened on June 4, 1906, the Healey Sewer Machine and Construction Company being awarded the contract.

The work was separated into three sections, as follows:

Section No. 1.—Diamond drill borings on lines crossing the Harlem and East rivers. Estimated linear feet....	2,150
Section No. 2.—Wash borings in Borough of Brooklyn. Estimated linear feet	1,300
Section No. 3.—Wash borings in Borough of Manhattan. Estimated linear feet	1,300

Bids for doing the work were received as follows:

Name of Bidder.	Section 1. Diamond Drill Borings.		Section 2. Wash Borings.		Section 3. Wash Borings.		Total Amount of Bid.
	Lin. Ft.	Price Per Ft.	Lin. Ft.	Price Per Ft.	Lin. Ft.	Price Per Ft.	
Healey Sewer Machine & Construction Co....	2,150	$11.30	1,300	$0.60	1,300	$0.45	$25,660.00
Phœnix Construction & Supply Co.	2,150	12.75	1,300	1.75	1,300	1.50	31,637.50
United Engineering & Contracting Co.	2.150	23.70	1,300	0.75	1,300	0.60	52,710.00

The work was commenced on June 15, 1906, and completed on October 10.

BORINGS MADE.

	Lin. Ft.			
Section 1	2,235.6	Diamond drill	at $11.30	$25,262.28
Section 2	1,307.4	Wash borings	at .60	784.44
Section 3	1,026.9	Wash borings	at .45	462.11
Total	4,569.9	Amount certified for payment		$26,508.83

On Section No. 1, thirty-six diamond drill borings were made, having a total depth of 2,235.6 linear feet, or an average depth of 62.1 linear feet; of the wash borings on Sections 2 and 3, one hundred and twelve were made, having a total depth of 2,334.3 linear feet, or an average depth of 20.8 linear feet.

PENNA., N. Y. & LONG ISLAND RAILROAD.

The progress of work on the tunnel railroad of the Pennsylvania, New York and Long Island Railroad Company since construction was begun in 1903, has been given each year in previous reports. Following is the status of this work during 1906:

Beginning at a point on the railroad of the Pennsylvania, New Jersey and New York Railroad Company on the west bank of the North river, the two tunnels extending to and under that river to the west side of Eleventh avenue, in Manhattan, have been fully excavated and iron lined, and the concrete lining is now being laid therein. These tunnels are each 6,116 feet in length. From Eleventh avenue eastward to the Terminal Station site at the east side of Tenth avenue, a distance of 982 feet, excavation has been continued to within 200 feet of Tenth avenue.

On the Terminal site the excavation of the necessary 2,500,000 cubic yards is nearing completion, and the work is being pushed on the foundations for the building, as well as on the work in the vicinity of the tracks of the tunnel which are below these foundations.

Work is under way on the approaches to the tunnels immediately east of Seventh avenue, and 70 per cent. of the excavation for the tunnels extending under Thirty-second street to the First avenue shafts has been completed. The excavation for the tunnels under Thirty-third street extending between the same points is about 86 per cent. completed, and concrete is now being laid therein. The length of these two lines is about 10,500 linear feet.

The First avenue shafts from which extend the four tunnels under the East river, are, with a small percentage of concrete still to be laid, completed.

The four single-tube tunnels extending under the East river to the Long Island City shafts have been about 25 per cent. excavated and iron-lined, while the said shafts are almost completed. These tunnels are each to be about 3,900 feet in length.

The excavation for the tunnels extending eastward from the Long Island City shafts has been about 80 per cent. completed and 72 per cent. iron-lined, and the concrete work therein is now being prosecuted. These lines are each about 3,900 feet in length.

About 90 per cent. of the real estate required for the yard in Long Island City, to be known as "Sunnyside Yard," has been acquired, and condemnation proceedings are about to be instituted for the remainder.

HUDSON & MANHATTAN COMPANY'S TUNNELS.

The New York and Jersey Railroad Company and the Hudson and Manhattan Railroad Company on December 1 were consolidated under the corporate name of the Hudson & Manhattan Railroad Company. The progress of work on these two tunnel railroads from Hoboken and Jersey City, respectively, under the Hudson river to Manhattan, has been set forth in detail in previous reports of the Board. A synopsis of the work done on both these railroads during 1906 is given, in order of divisions, as follows:

New York & Jersey Railroad Division.

The westbound tunnel of the New York approach has been extended from a point under Christopher street, 230 feet east of the easterly line of Bleecker street, along Christopher street to Sixth avenue, to a point 20 feet south of the south line of Tenth street; a total distance of 1,373 feet constructed during the year.

The eastbound tunnel of the New York approach has been extended from a point on Greenwich street, 100 feet north of the north line of Barrow street, to Christopher street, and along Christopher street to a point 65 feet east of the east line of Waverley place; a total distance of 2,098 feet constructed during the year.

Work on the Hudson street station has been completed, with the exception of stairways and passageways leading to a connection with the street through private property, this work being executed by tunneling between tubes with a roof shield.

Work on the Sixth avenue extension is being advanced. It was commenced late in the year, and was largely preliminary to the actual construction, consisting of the assembling of plant, underpinning of the elevated railway structure, and reconstruction of sewers and other pipes.

The Eighteenth street sewer is nearly completed, the following amount of sewer having been constructed during the year:

UNDER PIER (NEW) NO. 59.

816 ft. 5′ 0″ x 4′ 6″ wooden barrel sewer.
816 ft. 5′ 0″ x 3′ 9″ wooden barrel sewer.

WEST EIGHTEENTH STREET, BETWEEN NORTH RIVER AND SIXTH AVENUE.

743 lin. ft. 5′ 6″ x 8′ 0″ rectangular sewer.
875 lin. ft. 6′ 0″ circular sewer.
2,270 lin. ft. 5′ 9″ circular sewer

Hudson & Manhattan Railroad Division.

There have been built within the State of New York, under the river bed, a total of 1,714 feet of tunnel. A large amount of work has been done on the approaches in the City of New York in connection with the Church street terminal. As to the terminal itself, all buildings on the site have been removed, and thirty-five surrounding foundation caissons and two interior foundation caissons have been sunk; this work requiring 36,000 cubic yards of excavation, and 15,000 cubic yards of concrete. In order to avoid the possibility of any settlement of the foundations of the buildings adjoining the approaches to this terminal on Cortlandt street and Fulton street, these foundations are being underpinned, and about two-thirds of this work has been completed. The sewer on Dey street has been diverted by constructing 209 linear feet of 4′ 0″ x 2′ 8″ egg-shaped sewer.

WEST SIDE TRACKS, N. Y. C. & H. R. R. R.

Pursuant to Act of the Legislature relative to the removal of steam railroad tracks operating at grade in the streets of the Borough of Manhattan, studies have been made for a subway along Eleventh avenue and other streets to place the tracks of the New York Central & Hudson River Railroad in a subway on the west side of Manhattan. Negotiations are pending looking to the ultimate carrying out of this work. As showing the status of this subject to date with respect to the studies made and work done by the Engineering Department, annexed is a letter of your Engineer addressed to the Board under date of November 14:

New York, November 14, 1906.

Hon. A. E. Orr, *President, Rapid Transit Board.*

Dear Sir:—In accordance with a statute passed by the last Legislature of the State of New York which became a law on March 26, 1906, being Chapter 109 of the Laws of 1906, entitled:

> "An Act to terminate the use of streets, avenues and public places in the City of New York, in the Borough of Manhattan, by railroads operated by steam locomotive power at grade,"

and pursuant to the consequent order by the Board, I have made a thorough investigation of the above mentioned subject, and have had careful surveys and borings made. These preliminary inquiries were essential to a complete understanding of the subject, and have necessarily consumed much time. I now beg to report as follows:

I find that the only railroad tracks to which the Act applies are those located on the west side of the Borough of Manhattan belonging to the New York Central & Hudson River Railroad Company. There are other tracks belonging to other companies which are operated by steam locomotive power at grade, but, according to paragraph 8 of the Act, the law does not "affect or apply in any way to a corporation operating a steam surface railroad in the City of New York for the purpose only of transporting freight from its wharves, docks or piers to its freight yards or depots in said City over tracks not more than one-half mile in length."

From information derived from the officers of the Railroad Company, it appears that the tracks of the New York Central & Hudson River Railroad on the west side of the Borough of Manhattan are located, beginning at Spuyten Duyvil Creek, and going south to 72d street, on their own right of way; except at the points where these tracks cross intersecting streets, and on Twelfth avenue, between 141st street and 135th street, where title has been acquired by the City. The tracks cross at grade the following streets, which have been regulated, graded and paved, and are now in use, viz.:

Dyckman street; Depot Road (177th street); 165th street; 158th street; 155th street; 151st street; 145th street; Manhattan Valley (129th to 138th streets, inclusive); 96th street; 79th street.

From 72d street to 61st street the tracks are on the right of way of the company; from 61st street to 33d street the tracks are on the surface of Eleventh avenue; from 33d street, they are on the company's own right of way, and the main tracks run diagonally across the blocks between 33d and 30th streets to Tenth avenue, crossing 32d and 31st streets at grade. From 30th street to Bloomfield street the tracks are on the surface of Tenth avenue, and from Bloomfield street to Canal street the tracks are on the surface of West street. Here they turn east on Canal street to the intersection with Hudson street, where they turn south on Hudson street and run into the yard at St. John's Park.

From 72d street to 59th street all the space between the main tracks and the river is occupied by a railroad yard, the intersecting cross streets for this distance having been closed by act of the Legislature.

Between 37th and 30th streets the company has an extensive yard, 33d street and 32d street being occupied by railroad tracks between Eleventh avenue and the river front, and 31st street being occupied by railroad tracks between Tenth avenue and the river front.

The Act contemplates an agreement with the railroad company, which shall provide for the construction by the company at its own cost of a subway either under the roadbed of the present tracks, or under other streets to which the tracks shall be removed. As a condition of the agreement, "all present franchises of every kind on, across, through and along such streets" are to be surrendered and the tracks removed therefrom at the cost of the railroad company. The Act therefore looks only to the construction of subways in lieu of the present surface tracks.

Nevertheless, I think that from 72d street to Spuyten Duyvil Creek, assuming that the railroad here is on its own right of way, it would be a far more practicable method of dealing with the subject to have the tracks remain at the present elevation, except at the crossing of Manhattan Valley, between 129th and 138th streets, where I should propose to elevate the tracks. At the other street crossings of this portion of the route I should propose to elevate the streets and have the same cross above the railroad tracks; and from the west side of the railroad each street would go down on an incline parallel to the railroad until it reached the level of the wharves or piers along the river front. The above seems to be the most practical mode of avoiding any grade crossing of streets and railroad tracks for this portion of the route, although it will require an amendment to the Act; but such amendment would not appear to be inconsistent with the main purpose of the Legislature.

Subways at these crossings could be built, but the expense would be very great, and it does not seem to be a desirable thing to do, as the main object of the Act can be obtained at a much lower expense.

I submit herewith a plan showing the manner in which it is recommended that the street crossings north of 59th street should be dealt with. If it is thought necessary to have plans for subways under the cross streets on this part of the route, such plans can be readily prepared.

I have been in consultation with the engineers of the New York Central & Hudson River Railroad in regard to the problem of removing the New York Central tracks from the surface of the longitudinal streets of the route. They have expressed their opinion that the best solution would be to build an elevated structure from 59th street, south, along the river front to Franklin street, the lower four blocks between West street, Washington street, Laight street and Franklin street being occupied by an elevated railroad yard. The reason for this preference is obvious, as besides being cheaper to build, such a road would offer opportunities for convenient connections to the river piers, involving better facilties for taking care of the river traffic than any other way.

Mr. William Barclay Parsons recommended an elevated railroad along the river front in his report to the Rapid Transit Board dated February 19, 1903.

As, however, the question of an elevated railroad cannot be considered under this Act, I have, after consulting with the New York Central engineers, prepared plans for a subway to take the place of the present New York Central tracks now operating on the surface of the streets south of 59th street.

Herewith are submitted two sets of plans for a subway following two different routes, namely:

Alternative 1. Lay-out following approximately the same avenues and streets as the present tracks of the New York Central until the intersection of Canal street and West street is reached, and from Canal street, instead of going east on Canal street, continuing down West street to Franklin street.

Alternative 2. Beginning at about 64th street, crossing the present railroad yard in a southwesterly direction to Twelfth avenue, and along Twelfth and Thirteenth avenues and Marginal street and West street to Franklin street.

Alternative 1 is to my mind preferable to Alternative 2, on account of the lower cost of construction. The New York Central officials, however, have expressed the opinion that if a subway is to be built at all a line along the river front would be preferable; but I have not yet received a final statement from them to that effect.

The yard at 30th street, for both alternatives, is located upon the plans in such a way that one would enter the part of the yard used for freight from the subway on Eleventh avenue. The freight yard on the east side of Eleventh avenue would be entirely underground, and connect with the surface by elevators. The freight yard on the west side of Eleventh avenue would come to the surface at Twelfth avenue, where there would be easy access to the same for teams from the street. On the plans I have shown 31st and 32d streets closed for street traffic between Eleventh and Twelfth avenues, as also is the case now. To connect with the river piers it will be necessary to cross Twelfth avenue on grade from this yard.

At other places where a connection with a pier is desired, private property will have to be acquired for the construction of inclined tracks for the purpose of coming up from the subway tracks to the surface at the level of the piers, it being necessary here also to cross the street along the river front at grade.

In considering the practical working of a subway railroad in connection with the piers along the Hudson river, it is to be observed that in every case, except at the railroad yard near 30th street, the number of cars that can be operated in connection with any one pier must necessarily be governed by the length of the tracks located upon private property acquired for this purpose. The best method of getting up from the grade of the subway to the surface of the piers would be by a switch curving easterly into private property, and there forming a Y with a track leading westerly back towards the pier and over the surface of the subway and upon the surface of the street.

In the lower part of the city, south of Bloomfield street, the blocks at right angles to the river are about 360 feet in length or less. With this length at our disposal, it would not be practicable to operate more than two cars at a time in connection with the piers, which, of course, would be slow and expensive.

Connections with private enterprises along the road would be by a subway siding from the main line, and in many cases it would be necessary to acquire private property for this purpose. To connect such a subway siding with the surface, elevators would have to be used.

On the plans I have shown the southern terminus of the railroad between West street, Washington street, Laight street and Franklin street, instead of at St. John's Park, thereby avoiding the complications involved in crossing the contemplated new rapid transit subways on Washington street, Hudson street and Desbrosses street. The private property necessary to construct the new yard will have to be acquired.

At 53d street the New York Central officials wish to construct a two-track spur running east to connect with the Grand Central yard where 53d street runs into the same, and operate this spur and the part of the line along the river front north of 53d street partially as a passenger railroad. This would greatly increase the efficiency of the New York Central in handling its suburban traffic.

It may be doubtful whether such a subway could be constructed under the terms of Chapter 109 of the Laws of 1906, but it could certainly be constructed under the provisions of Section 32 of the Rapid Transit Act. I have indicated in the accompanying plans the beginning of such a subway at the northern and western end thereof. The detailed plans for such a road, if approved by the Board, could readily be prepared.

Having in view the possibility of a crosstown subway at 53d street, the main line of both alternatives for the road south of 59th street is laid out on the accompanying plans as a four-track structure down to 53d street, and a two-track structure south of this street. In connection with the main line, I have laid out a number of sidings and connections to yards and to piers opposite the yard at 30th street. I have, however, not shown all the connections to the different piers and private enterprises along the line except in the form of typical designs.

The cost of construction for both alternatives, including yards and connections to same, as shown on the accompanying plans, is estimated as follows:

For Alternative 1	$29,700,000
For Alternative 2	33,150,000
For reconstruction of present connections to river piers and private enterprises	850,000

This does not include the cost of private property which it is necessary to acquire.

In evolving either one of these projects, it may be found advisable to add tracks to facilitate operation in many places, and this would add to my estimate of the cost as given above.

As I have already stated, I have been in consultation with the engineers of the New York Central & Hudson River Railroad Company, but they are not yet ready to give any definite statement about their views in regard to the question of substituting a subway for their present tracks. This has caused some delay in preparing my plans, because I have wished as far as possible, before I submitted them, to be acquainted with the views of the New York Central officials on the matter. Within a short time, it is expected that we may receive a communication from them embodying their views fully on this subject.

Respectfully yours,
George S. Rice,
Chief Engineer.

ENGINEERING STAFF.

But few changes occurred in the executive staff of the Engineering Department during the year. Mr. John H. Myers, formerly Senior Assistant Engineer of the Second Division, was appointed, on May 3, to the position of Division Engineer, to take charge not only of that division, but to be engaged also on the work necessitated under the provisions of the Act passed by the Legislature for a subway for the tracks of the New York Central & Hudson River Railroad on the west side of the city.

On December 27, 1906, Messrs. Latey & Slater were appointed Consulting Electrical Engineers, to take effect January 1, 1907. It was also decided to retain as Consulting Architects Messrs. Heins & La Farge, who were appointed in 1901, and who since have been engaged in that capacity.

The total staff of the Chief Engineer during 1906 numbered 334 appointments, as against a total of 329 for the previous year, divided as follows:

1 Deputy Chief Engineer.
5 Division Engineers.
3 General Inspectors.
115 Assistant Engineers.
23 Draughtsmen.
68 Rodmen.
37 Axemen.
10 Inspectors of Steel.
47 Inspectors of Masonry.
5 Cement Testers.
1 Steel Chemist.
1 Secretary.
17 Clerks.
1 Photographer.

All changes and additions to the staff during the year are shown in table appended.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
John H. Myers	Division Engineer	May 3, 1906		Promoted from Assistant Engineer.
Wilson F. Smith	Assistant Engineer	April 1, 1900	May 1, 1906	Transferred to Board of Water Supply.
Gustav C. Davin	"	September 1, "	December 13, "	Died.
Lazarus White	"	" 1, "	March 12, "	Resigned.
Tyrell B. Shertzer		December 19, "	" 24, "	"
Lawrence C. Brink	"	January 8, 1901	January 24, "	"
John W. Goodridge	"	March 11, "	August 1, "	"
Samuel F. Thomson	"	July 23, 1903	March 5, "	"
James A. Guttridge	"	August 16, 1904	February 16, "	"
Edwin L. Sprague, Jr.	"	" 19,	June 18, "	Transferred to Board of Water Supply.
Kenneth B. Emerson	"	" 1, 1905	February 26, "	Resigned.
John P. Hogan	"	" 1, "	January 1, "	"
Eliot N. Smith	"	" 1, "	March 12, "	"
Macrae Sykes	"	" 1, "	April 9, "	Transferred to Board of Water Supply.
John P. H. Perry	"	" 2, "	February 19, "	Resigned.
Donald W. Howes	"	September 1, "	" 13, "	"
John J. Murphy	"	" 1, "	July 18, "	"
Charles E. Conover	"	April 1, 1906		Promoted from Draughtsman.
John Cooperstock	"	" 1, "		" " "
Leo C. F. Devery	"	" 1, "		" " Rodman.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
William Hotter	Assistant Engineer	April 1, 1906		Promoted from Rodman.
Jasper T. Kane	"	" 1, "		" " Draughtsman.
Charles Rodenburg	"	" 1, "		" " "
Frank H. Berger	"	May 11, "		" " "
Hartwell Bishop	"	" 11, "	December 11, 1906	Resigned.
Joseph A. Connelly	"	" 11, "		
Clifford M. Holland	"	" 11, "		
Robert J. Lucas	"	" 11, "	August 19, "	"
Alfred S. Phillips	"	" 11, "		Promoted from Rodman.
Rudolph Quanz	"	" 11, "		" " "
Conrad D. Trubenbach	"	" 11, "		
Edgar S. Closson	"	" 16, "		
Max A. Jaffy	"	" 16, "	September 10, "	Resigned.
John F. Perrine	"	" 16, "		
Charles J. Slipper	"	" 16, "		
James E. Beswick	"	" 17, "		Promoted from Rodman.
William T. Fitzpatrick	"	" 17, "		" " "
Charles E. Weber	"	June 1, "		" " Draughtsman.
Paul M. Entenmann	"	" 7, "		" " "
Raphael J. Smyth	"	" 7, "		" " "

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Samuel Behrman	Assistant Engineer	July 1, 1906		Promoted from Draughtsman.
George Abraitys	"	August 1, "		" " Rodman.
Frederick B. Barshell	"	" 1, "		
Lewis E. Blackman	"	" 1, "		" " Rodman.
Robert F. Brushaber	"	" 1, "		" " Rodman.
Joseph J. Elkin	"	" 1, "		" " Draughtsman.
Richard A. Fiesel	"	" 1, "		" " Rodman.
William G. Golden	"	" 1, "		" " Draughtsman.
John E. F. Higgins	"	" 1, "		" " Rodman.
Charles C. Jabureck	"	" 1, "		" " Draughtsman.
Aksel H. Jorgensen	"	" 1, "		" " Rodman.
William C. Kochendoerffer	"	" 1, "		" " Draughtsman.
Louis Koenig	"	" 1, "		" " Rodman.
Charles W. McInenly	"	" 1, "		" " "
Frederick H. Mellert	"	1, "		" " "
James Pearce, Jr.	"	" 1, "		" " "
John R. Pennefather	"	" 1, "		" " "
John S. Rae	"	" 1, "	December 1, 1906	" " " —Resigned.
Charles F. Rohde	"	" 1, "		" " Draughtsman.
Philip Sachs	"	" 1, "		" " "

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Elliot F. Soule, Jr.	Assistant Engineer	August 1, 1906		Promoted from Rodman.
Charles E. Thomson	"	" 1, "		" " "
Charles M. Torpey	"	" 1, "		" " "
William P. Vallely	"	" 1, "		" " Draughtsman.
Frederick P. Volckmann	"	" 1, "		" " Rodman.
William H. Warren	"	" 1, "	November 8, 1906	" " " —Resigned.
Edward H. Wernberg	"	" 1, "		" " "
Frank Willetts	"	" 1, "		" " "
Charles J. McGronan	"	September 1, "		
Charles N. Pinco	"	October 1, "	December 24, "	" " Draughtsman—Rgnd.
Harry D. Appleby	"	November 1, "		" " "
Edmond O. Cox	"	" 1, "		" " "
Leo Haber	"	" 1, "	" 17, "	" " " —Rgnd.
Cornelius Mulcahy	"	" 1, "		" " "
Claude J. Rich	"	" 1, "		" " "
Frank P. Lothrop	Draughtsman	June 9, 1904	January 1, "	Resigned.
William L. Hanavan	"	July 1, 1905	February 21, "	"
Alexander S. Solow	"	March 29, 1906	June 11, "	"
Joseph Courter	"	April 1, 1906		Promoted from Rodman.
Lee H. Cummings	"	" 1, "		

Name.	Title.	Appointment to Present Rank.	Service. Cessation of	Remarks.
Joseph Gaffney	Draughtsman	April 19, 1906		Promoted from Rodman.
Jacob Hayman	"	May 12, "		
Squire J. Vickers	"	" 25, "		
Henry O. Huntting	"	" 25, "		
Stephen L. Bower	"	June 1, "		
Ralph R. Clark	"	" 1, "		
Rudolph H. Peppmuller	"	July 2, "		
Oscar F. Untervinger	"	October 1, "		
Charles G. Guttinger	"	" 11, "		Promoted from Rodman.
Manuel H. Abremovich	"	November 9, "	December 17, 1906	Resigned.
Frederic B. Ryan	"	" 9, "	" 17, "	"
Louis D. Koop	"	" 16, "	" 17, "	"
Wilfred G. Southern	Rodman	July 28, 1902	April 1, "	"
Thomas Chambers	"	April 16, 1903	September 4, "	"
Richard J. Cullen	"	" 16, "	" 1, "	"
Julius A. Lewis	"	May 6, "	" 1, "	"
Robert A. Kearns	"	" 11, "	July 1, "	Transferred to Borough of The Bronx.
George S. Dillon	"	" 18, "	January 1, "	Transferred to Department of Bridges.
Leo Feibel	"	" 11, 1904	April 1, "	Resigned.
John O'Rourke	"	August 15, 1904	June 1, "	"

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
William A. Evalenkos	Rodman	October 17, 1904	March 16, 1906	Resigned.
Charles R. Hulsart	"	June 21, 1905	February 13, "	"
Bruno J. Feldman	"	July 25, "	June 12, "	"
Travis E. Harris, Jr.	"	" 25, "	February 15, "	Transferred to Borough of Richmond.
William L. Booth	"	" 26, "	March 19, "	Resigned.
William L. Van Valkenburg	"	" 26, "	January 1, "	Transferred to Department of Parks.
George Wintner	"	" 26, "	September 1, "	Resigned.
Henry C. Garretson	"	" 28, "	March 20, "	"
Andrew L. Koch	"	" 28, "	October 16, "	"
Albert F. Harman	"	August 11, "	June 1, "	"
Harry M. Adams	"	" 24, "	September 1, "	"
George M. Burrell	"	" 28, "	July 16, "	"
Philip J. Barry	"	November 1, "	September 17, "	Transferred to Borough of The Bronx.
Joseph Silberstein	"	March 7, 1906	" 1, "	Reinstated—Resigned.
Arthur Avery	"	April 1, "	August 14, "	Promoted from Axeman—Transferred to Dock Department.
Louis J. Caemmerer	"	" 1, "		Promoted from Axeman.
Joseph A. Donohue	"	" 1, "		" " Temporary Axeman.
Otto H. Jaeger	"	" 1, "		" " Axeman.
John McKeon	"	" 1, "		" " "
Louis B. Manheimer	"	" 1, "	October 16, "	Resigned.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Harold B. Catlin	Rodman	April 10, 1906		Promoted from Axeman.
Peter F. Daly	"	" 10, "		
John M. Dunbar	"	" 10, "		
Thomas F. McNamara	"	" 10, "		
Frank J. Harte	"	" 19, "		" " "
Samuel S. Cox, Jr	"	May 16, "		" " "
Lewis W. Hagerty	"	" 16, "		" "
Hippolyte Bergman	"	June 15, "	September 1, 1906	Reinstated—Resigned.
Charles P. Madden	"	" 15, "		
Howard Fitzpatrick	"	July 12, "		Reinstated.
Edward Bergman, Jr	"	August 1, "		Promoted from Axeman.
Albert D. Clappe	"	" 1, "		" " "
Frank A. Devlin	"	" 1, "		" " "
Arthur C. Fyffe	"	" 1, "		" "
Otto E. Heun	"	" 1, "		" " "
Ludwig A. Jauss		" 1, "		" " "
John R. Lambert	"	" 1, "	November 7, "	Transferred to Dock Department.
Joseph A. Leavy	"	" 1, "		Promoted from Axeman.
William C. Martin	"	" 1, "	October 5, "	Promoted from Axeman—Transferred to Dock Department.
John H. Mullin	"	" 1, "		Promoted from Axeman.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Grover C. Rauch	Rodman	August 1, 1906		Promoted from Axeman.
Edmond Ryan	"	" 1, "		" " "
Franklin J. Ryan	"	" 1, "		" "
Charles C. Schriefer	"	" 1, "		' " "
John E. Simmons	"	" 1, "		" " "
William A. Smith	"	" 1, "		" " "
Albert A. Sommerfeld	"	" 1, "		" " "
William A. Walsh	"	" 1, "		" " "
Edward J. Buchanan	'	November 12, "		
David S. Mosesson	"	" 12, "		
Frederick M. Beer	"	" 13, "		
Charles J. Eldridge	"	" 13, "		
Arthur J. Carson	"	" 22, "		
John S. Ryan	"	" 22, "		
John G. Hoben	"	December 6, "		Promoted from Axeman.
John W. Soule	"	" 6, "		
Richard H. Burton	"	" 27, "		
Walter W. Miller	Temporary Rodman	September 1, "		
William H. Bressler	"	" 4, "		
Edward P. Kelly	Axeman	August 20, 1901	May 5, 1906	Resigned.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Charles J. O'Neill	Axeman	June 1, 1904	January 23, 1906	Died.
Joseph J. Sley	“	July 19, 1905	April 16, “	Transferred to Borough of Richmond.
Edward A. Malmquist	“	August 3, “	July 1, “	Resigned.
Alexander C. Schilling	“	“ 3, “	February 15, “	Transferred to Borough of The Bronx.
William C. Colvin	“	“ 7, “	April 16, “	“ “ “ “ Brooklyn.
George J. Burchill	“	“ 18, “	November 12, “	“ “ “ “ The Bronx.
John J. Goff	“	“ 18, “	August 14, “	Transferred to Department of Water Supply, Gas and Electricity.
August Von Bartheld	“	January 9, 1906	“ 1, “	Reinstated—Transferred to Borough of The Bronx.
George Burrows	“	April 5, “	“ 15, “	Resigned.
Chester E. Booth	“	“ 25, “	....	
Charles M. Madden	“	“ 26, “	....	
James C. Gallagher	“	“ 30, “	....	
Ernest H. Havemann	“	“ 30, “	November 1, “	Transferred to Borough of The Bronx.
Richard T. Wallace	“	“ 30, “	....	
Walter S. Beattie	“	May 1, “	August 7, “	Dismissed for unsatisfactory work.
George F. Carlin	“	“ 1, “	....	
Edward P. Hamilton	“	“ 1, “	December 3, “	Transferred to Department of Water Supply, Gas and Electricity.
Alfred H. Redding	“	“ 1, “	....	
Hans Tradelius	“	“ 1, “	October 4, “	Resigned.
Rudolph G. Pundt	“	“ 3, “	....	Promoted from office boy.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
James F. Joy	Axeman	May 11, 1906		
Charles V. Masterson	"	" 11, "		
Edmund J. Tighe	"	" 11, "		
Felix P. Carroll, Jr	"	" 15, "		
Joseph B. Fitzgerald	"	September 17, "		
Joseph F. Hawkes, Jr	"	" 18, "		
John J. Kearns	"	" 18, "		
Joseph A. Lewis	"	" 18, "		
Frederick Phillips	"	" 18, "		
Charles S. Gray	"	November 3, "		
Charles Schultz	"	" 3, "		
Emil F. Zipfel	"	" 3, "		
Frederick F. Denzin	"	" 7, "		
Alfred G. Purgold	"	" 7, "		
Harry Kantrovitz	"	" 12, "		
Jeffroy J. Lewin	"	" 27, "		
Samuel W. Berliner	"	December 3, "		
Cyril J. Carroll	"	" 3, "		
Arthur P. Fogerty	"	" 3, "		
James Dolan	"	" 5, "		

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
William Meehan	Axeman	December 5, 1906		
Henry P. Labelle	“	“ 5, “		
Joseph A. Brunner		‘ 6, “		
Edward H. Gross	Temporary Axeman	November 16, 1905	April 1, 1906	Service ceased on promulgation of regular eligible list.
George A. Mortimer	“	“ 16, “	February 12, “	Resigned.
John L. Stroub	“	‘ 16, “	April 1, “	Service ceased on promulgation of regular eligible list.
Patrick A. Whelan	“	‘ 16, “	“ 1, “	Service ceased on promulgation of regular eligible list.
Joseph O'Donnell	“	December 28, “	“ 1, “	Service ceased on promulgation of regular eligible list.
John F. Fox	“	March 16, 1906	“ 1, “	Service ceased on promulgation of regular eligible list.
David B. Oviatt	Inspector of Steel	August 30, 1900	January 18, “	Resigned.
George L. Lucas		January 9, 1906		Reinstated.
Michael Henahan	Inspector of Masonry	April 1, 1902	April 22, “	Resigned.
Clarence B. Riggs	“	August 21, “	October 14, “	Died.
Thomas Curry	‘	May 22, 1906	“ 25, “	Dismissed for lack of work.
Forbes G. Gerard	“	“ 22, “	“ 4, “	“ “ “ “
Frank Nearing	“	“ 22, “	November 25, “	“ “ “ “ ‘
Elmer S. Van Aken	“	‘ 22, “	October 4, ‘	“ “ “
Patrick F. Burns	“	“ 24, “	“ 15, “	“ “ “
William H. Hanrahan	“	“ 24, ‘	August 21, “	Resigned.
Robert F. Higgins	“	“ 24, “	July 24, “	Dismissed for unsatisfactory work.

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Patrick J. Lovely	Inspector of Masonry	May 24, 1906	....	
Thomas B. McGuire	“	“ 24, “	October 22, 1906	Dismissed for lack of work.
Thomas Quinn	“	“ 24, “	June 25, “	Resigned.
Michael Reilly	“	“ 24, “	October 22, “	Dismissed for lack of work.
Charles P. Sample	“	“ 24, “	August 14, “	Resigned.
Alexander H. Stewart	“	“ 24, “	December 18, “	Transferred to Department of Bridges.
James Walsh	“	“ 24, “	....	
William Walsh	“	“ 24, “	....	
Henry C. Duncan	“	June 18, “	....	Reinstated.
Thomas F. McCormick	“	“ 28, “	July 13, “	“ —Resigned.
Lawrence C. Manuell	“	July 13, “	....	
George Schley	“	August 24, “	....	
John A. Kennedy	“	“ 27, “	....	
Matthew M. Feely	Stenographer & Typewriter.	“ 14, 1900	January 25, “	Resigned.
Robert H. Farrell	“	November 1, 1906	....	
Charles E. Miller	Temporary Stenographer and Typewriter	April 2, “	July 1, “	Period of temp'y employment expired.
William Goldstein	Clerk	August 1, “	....	Promoted from Junior Clerk.
John F. Lilley	“	“ 1, “	....	“ “
Charles B. Magan	Junior Clerk	“ 1, “	....	“ “ Office Boy.
James C. Rose	“	“ 1,	....	“ “ “

Name.	Title.	Appointment to Present Rank.	Cessation of Service.	Remarks.
Bernard A. Ball..................	Office Boy................	December 1, 1905	April 9, 1906	Transferred to Finance Department.
Edward F. Maher................	"	March 26, 1906	....	
Frank R. Haley..................	"	April 30, "	....	
Albert E. Schwartz..............	"	July 16, "	....	

The engineering executive staff, at the end of the year, consisted of the following officers:

Alfred Craven	Deputy Chief Engineer.
George Hallett Clark	Engineer First Division.
John H. Myers	Engineer Second Division.
C. V. V. Powers	Engineer Third and Fourth Divisions.
Frederick C. Noble	Engineer Fifth Division.
Amos L. Schaeffer	Engineer Sewer Division.
Sverre Dahm	General Inspector of Designs.
W. A. Aiken	General Inspector of Material.
D. L. Turner	General Inspector of Stations.
M. J. Farrell	Secretary to Chief Engineer.
Pierre P. Pullis	Official Photographer.
Heins & La Farge	Consulting Architects.
Latey & Slater	Consulting Electrical Engineers.

It has been customary to give each year the number of accidents that have occurred on the work. The casualties during 1906 amounted to 110; of this total number 7 proved fatal, and 105 included employees on the work.

The years 1905 and 1906 may be regarded as an epoch in the history of rapid transit, looking to construction of future subways on so extensive a scale as to have been hardly conceivable a few years ago, or never contemplated within the past decade.

From the time that the first Board, in 1875, had been invested with office, the members of which Board were reappointed later under the Act of 1891, and subsequently a new Board appointed by the Act of 1894, being the present Rapid Transit Board, the labors of the Rapid Transit Commissioners were beset with difficulties in its efforts toward the acquirement of adequate transit facilities, apparently so overpowering as to seem to be almost insurmountable. The various stages in the development of the rapid transit question have been recounted in detail in previous reports of the Board.

Finally, the year 1899 marked an era in rapid transit, in the realization of what so long was sought to be attained. The autumn of that year saw the first step toward the attainment of actual results, when bids were advertised for the first rapid transit contract, the present subway, and subsequently let, and work begun on March 24 of the following year by a fitting public ceremony in front of the City Hall. That first spadeful of earth dug from the soil of Manhattan in so imposing a cause, was the fruition of what in the years to follow will probably see a system of rapid transit so complete as to transcend, in volume of traffic and mileage covered, that of any other city in the world.

The opening of the present subway, as had been anticipated, was a success from the very beginning, and its popularity since attested by a travel unprecedented in growth. Even before the opening of the present subway, the Board took into serious consideration the investigations necessary looking to the laying out of new routes, not only for Manhattan alone, but for all the boroughs of the Greater City, to afford the maximum of service that would ultimately be required for each borough.

To advert to the comprehensive plan adopted by the Board on May 12, 1905, in laying out routes for all the boroughs, I may call attention to the fact that practically all necessary steps to be taken in accordance with the Rapid Transit Act have, by the end of 1906, been so far developed that within the next few months, if the Board desire, contracts can be advertised for the letting of the subway routes approved by the Rapid Transit Board and the Board of Estimate and Apportionment. The surveys and necessary studies commenced early in 1904, and the numerous valuable data collated by the Engineering Department, have enabled the Board to advance to construction a large part of this comprehensive plan.

As giving an idea of the magnitude of the transportation question involved, and what steps will be necessary to afford facilities for future travel, I would call attention to the following conclusions adduced from a careful study of this question in relation to present population, and its constant growth, and what work is in store to meet the existing conditions:

The population of the territory comprising Greater New York has practically doubled itself each twenty-five years during the last half century, and will probably double itself again by 1930.

The total paid passenger traffic is increasing at such a rate that it will probably about double itself within the next decade.

In order to bring about the discontinuance of the overcrowded conditions now prevailing on all transportation lines in the Greater City, it is imperative that the following additional subways be constructed and put in operation:

1. Within the next five years, or by 1911—

For Brooklyn.—Two four track subways, in which ten-car trains can be operated, providing for eight additional tracks crossing the East River, either in tunnels or on bridges and traversing the borough.

For Manhattan and the Bronx.—Three four-track subways, for operating ten-car trains, traversing the two boroughs.

2. Within the second five years, or by 1916—

For Brooklyn.—Two more four-track subways.

For Manhattan and the Bronx.—Three more four-track subways.

3. Within the next decade—Ten four-track subways for Manhattan, The Bronx and Brooklyn combined.

These facts are of interest in connection with this whole question of transit facilities.

The Appellate Division of the Supreme Court having prescribed a limit of two years in the letting of future contracts, the studies and preliminary work instituted six months before the opening of the present subway, in 1904, have enabled the Board—which otherwise would not have been possible—to meet this time limitation and let contracts for such of the routes laid out as it deems necessary to put under immediate contract.

In connection with the manifold duties devolving upon the Chief Engineer in the conduct of the work of the Engineering Department during the year, due credit should be given for the valuable services and unremitting attention to the work on the part of the entire staff, and such efficiency and loyalty I take pleasure in acknowledging.

Respectfully submitted,

GEORGE S. RICE,
Chief Engineer.

REPORT

OF THE

AUDITOR

THE CITY OF NEW YORK.

BOARD OF RAPID TRANSIT RAILROAD COMMISSIONERS.

Auditor's Office, January 1, 1907.

The Honorable Board of Rapid Transit Railroad Commissioners.

GENTLEMEN—I have the honor to submit herewith a report of the Auditor, in relation to the finances of the Board of Rapid Transit Railroad Commissioners, for the period January 1, 1906, to December 31, 1906, giving in general and in detail, viz.:—

REQUISITIONS FOR THE GENERAL FUND: (Folio 313.) A statement showing the Requisitions made upon the Board of Estimate and Apportionment for the authorization for the issue of Revenue Bonds for the requirements of the Board of Rapid Transit Railroad Commissioners, from January 1, 1906, to December 31, 1906.

APPROPRIATIONS FOR THE GENERAL FUND: (Folios 314, 315.) A statement showing the Appropriations made by the Board of Estimate and Apportionment for the purposes of the Board of Rapid Transit Railroad Commissioners, from January 1, 1906, to December 31, 1906.

DISBURSEMENTS OF THE GENERAL FUND: Statements showing the Disbursements of the General Fund made under the direction of the Rapid Transit Board, from January 1, 1906, to December 31, 1906, viz.:

Administrative and General Office. (Folio 316.)
Engineering. (Folio 317.)
Legal. (Folios 318, 319.)

REQUISITIONS AND APPROPRIATIONS FOR THE MANHATTAN-THE BRONX CONSTRUCTION FUND. (Folio 320.) A statement showing the Requisitions made upon the Board of Estimate and Apportionment for the authorization for the issue of Corporate Stock of The City of New York, and the appropriations made by the Board of Estimate and Apportionment, the proceeds thereof to be applied to the requirements of the Manhattan-The Bronx Construction Fund, under provision of the contract with *John B. McDonald, Contractor,* dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

DISBURSEMENTS FOR EXTRA WORK DONE AND MATERIALS FURNISHED. MANHATTAN-THE BRONX CONSTRUCTION: (Folio 321.) A statement showing the requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the said Rapid Transit Board, to be made to *John B. McDonald, Contractor,* for Extra Work done and materials furnished under contract dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad from January 1, 1906, to December 31, 1906.

DISBURSEMENTS FOR REAL ESTATE. MANHATTAN-THE BRONX CONSTRUCTION: (Folios 322, 323, 324.) A statement showing the payments authorized under the direction of the Board of Rapid Transit Railroad Commissioners to be made for Real Estate acquired for and in behalf of The City of New York, under provision of the contract with *John B. McDonald, Contractor,* dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

CORPORATE STOCK OF THE CITY OF NEW YORK. BROOKLYN-MANHATTAN CONSTRUCTION: (Folio 325.) A statement showing the issues of Corporate Stock of The City of New

York, from January 1 1906, to December 31, 1906, the proceeds thereof to be applied to the construction of the Brooklyn-Manhattan Rapid Transit Railroad.

DISBURSEMENTS FOR WORK DONE AND MATERIALS FURNISHED. BROOKLYN-MANHATTAN CONSTRUCTION: (Folio 326.) A statement showing the requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the Rapid Transit Board, to be made to *Rapid Transit Subway Construction Company, Contractor,* for work done and materials furnished under contract dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad from January 1, 1906, to December 31, 1906.

DISBURSEMENTS FOR EXTRA WORK DONE AND MATERIALS FURNISHED. BROOKLYN-MANHATTAN CONSTRUCTION: (Folio 327.) A statement showing the requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the said Rapid Transit Board, to be made to *Rapid Transit Subway Construction Company, Contractor,* for Extra Work done and materials furnished under contract dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

DISBURSEMENTS FOR REAL ESTATE. BROOKLYN-MANHATTAN CONSTRUCTION: (Folios 328, 329.) A statement showing the payments authorized under the direction of the Board of Rapid Transit Railroad Commissioners, to be made for Real Estate acquired for and in behalf of The City of New York, under provision of the contract with *Rapid Transit Subway Construction Company, Contractor,* dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

PAYMENT OF INTEREST ON THE CORPORATE STOCK. BROOKLYN-MANHATTAN CONSTRUCTION: (Folio 330.) A statement showing the payments made under the direction of the City Comptroller for Interest due on the Corporate Stock issued by The City of New York, for the construction of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

BALANCES: (Folios 331, 332 333.) Statements showing the Yearly Balances of the General Fund, and of the Manhattan-The Bronx and the Brooklyn-Manhattan Construction Funds.

SECURITY: (Folios 334, 335.) A transcript of information relative to Securities.

RENTAL: (Folios 336, 337.) Statements showing the rental received by the City Comptroller under the lease by The City of New York of the Manhattan-The Bronx and the Brooklyn-Manhattan Rapid Transit Railroad.

A RECAPITULATION: (Folios 338 to 343, inclusive.)

Respectfully submitted,
H. A. D. HOLLMANN,
Auditor.

GENERAL FUND

REQUISITIONS.

Statement of Requisitions made upon the Board of Estimate and Apportionment for the issue of Revenue Bonds for the requirements of the Board of Rapid Transit Railroad Commissioners from January 1, 1906, to December 31, 1906.

December 14, 1905,	As stated on page 3805 of the minutes of the Rapid Transit Commission	$609,500.00
March 22, 1906,	" " " 3978 " " " " " "	30,000.00
June 7, "	" " " 4168 " " " " " "	25,660.00
December 6, "	" " " 4518 " " " " " "	66,000.00
	Total amount of Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners, from January 1, 1906, to December 31, 1906	$731,160.00

GENERAL FUND

APPROPRIATIONS.

Statement showing the Appropriations made by the Board of Estimate and Apportionment for the purposes of the Board of Rapid Transit Railroad Commissioners, from January 1, 1906, to December 31, 1906.

Date.	Issue of Revenue Bonds.	Proceeds Deposited in the City Treasury.	Total.
December 22, 1905. As stated on page 3242 of the minutes of the Board of Estimate and Apportionment	3½% Bonds, redeemable 1907..........	February 2, 1906... $2,895.00	
	4% " " "	" 13, " ... 5,000.00	
	4¼% " " "	" 23, " ... 30,000.00	
	4¼% " " "	" 28, " ... 25,000.00	
	4¼% " " "	March 14, " ... 50,000.00	
	4⅜% " " "	" 26, " ... 50,048.71	
	4⅜% " " "	April 14, " ... 30,000.00	
	4⅜% " " "	" 23, " ... 20,000.00	
	4⅜% " " "	" 25, " ... 15,000.00	
	4½% " " "	May 24, " ... 25,000.00	
	4⅜% " " "	June 20, " ... 50,000.00	
	4⅜% " " "	July 12, " ... 50,000.00	
	4¼% " " "	" 30, " ... 25,000.00	
	4¼% " " "	August 3, " ... 16,161.11	
	4% " " "	" 3, " ... 8,838.89	
	5% " " "	" 27, " ... 25,000.00	
	5% " " "	September 14, " ... 6,000.00	
	5% " " "	" 19, " ... 5,000.00	
	5% " " "	" 20, " ... 40,000.00	
	4% " " "	October 4, " ... 5,000.00	
	4% " " "	" 10, " ... 10,000.00	
	4% " " "	" 16, " ... 25,000.00	
	4% " " "	" 19, " ... 40,000.00	
	5% " " "	November 16, " ... 10,000.00	
	5% " " "	" 22, " ... 40,556.29	$609,500.00
		Amount carried forward..	..$609,500.00

GENERAL FUND—*Continued*

APPROPRIATIONS—Continued

Date.	Issue of Revenue Bonds.		Proceeds Deposited in the City Treasury.		Total.
			Amount brought forward..		$609,500.00
April 6, 1906. As stated on page 680 of the minutes of the Board of Estimate and Apportionment	5%	Bonds redeemable 1907..........	May 8, 1906..	$30,000.00	30,000.00
June 15, 1906. As stated on page 1516 of the minutes of the Board of Estimate and Apportionment	5%	“ “ “	November 22, 1906..	$9,443.71	
	5%	“ “ “	December 1, “ ..	1,910.00	
	4%	“ “ “	“ 3, “ ..	5,000.00	
	5%	“ “ “	“ 10, “ ..	4,306.29	
	5%	“ “ “	“ 11, “ ..	5,000.00	25,660.00
December 7, 1906. As stated on page 3140 of the minutes of the Board of Estimate and Apportionment	5%	“ “ “	December 12, 1906..	$25,000.00	
	4½%	“ “ “	“ 24, “ ..	5,612.96	
	5%	“ “ “	“ 24, “ ..	11,387.04	
	5%	“ “ “	“ 28, “ ..	10,000.00	
	5%	“ “ “	January 3, 1907..	3,091.97	
	5%	“ “ 1908..........	“ 9, “ ..	10,908.03	66,000.00
Total amount of appropriations made by the Board of Estimate and Apportionment, for the purposes of the Board of Rapid Transit Railroad Commissioners, from January 1, 1906, to December 31, 1906					$731,160.00

GENERAL FUND

DISBURSEMENTS

Statement showing the amount of Disbursements made under the direction of the Board of Rapid Transit Railroad Commissioners from January 1, 1906, to December 31, 1906.

ADMINISTRATIVE AND GENERAL OFFICE

Compensation of Commissioners	$30,000.00
Salaries	8,619.96
Office and Telephone Rentals	2,074.76
Stationery, Printing and Supplies	4,433.59
Postage	101.99
Sundry Contingent Expenses	154.38
Total Amount of Administrative and General Office Disbursements	$45,384.68

DISBURSEMENTS—*Continued*

ENGINEERING

Salaries	$482,445.23
Office and Telephone Rentals	20,583.18
Stationery, Printing and Supplies	3,204.69
Furniture	931.17
Telegraph Service	149.90
Locomobile Service	60.00
Lighting	36.57
Janitor Service	710.00
Engineering Instruments and Supplies	8,064.85
Maps, Plans, Prints, and Photographic Supplies	3,026.61
Disbursements (Traveling Expenses, etc.)	2,745.35
Stenography and Typewriting	5.10
Postage	477.65
Inspections, Tests and Analysis	3,331.77
Borings and Soundings	45,012.77
Architectural Services and Disbursements	8,767.45
Consulting Electrical Engineer's Services	1,250.00
Consulting Sanitary Expert, Services and Disbursements	2,930.89
Sundry Contingent Expenses	2,770.56
Total Amount of Engineering Disbursements	$586,503.74

DISBURSEMENTS—*Continued.*

LEGAL

ADVERTISING.		
Proposals for test borings	$38.00	
Advertising notices of a public hearing before the Board of Rapid Transit Railroad Commissioners, relative to the proposed contract for the Van Cortlandt Park extension of the Manhattan-The Bronx Rapid Transit Railroad	44.80	
Advertising notices in the matter of the application and petition of the Board of Rapid Transit Railroad Commissioners for the appointment of Commissioners by the Appellate Division of the Supreme Court in and for the First and the Second Judicial Districts, and the sittings of the said Commissioners, to determine whether certain proposed additional subway lines ought to be constructed and operated in the Boroughs of Manhattan and The Bronx, Brooklyn, and Queens, New York City	34,591.26	
		$34,674.06
CLERICAL SERVICE.		
Stenographic services rendered to the Commissioners appointed by the Appellate Division of the Supreme Court in and for the First and the Second Judicial Districts, to determine whether certain proposed additional subway lines ought to be constructed and operated in the Boroughs of Manhattan and The Bronx, Brooklyn, and Queens, New York City		1,525.20
Amount carried forward		$36,199.26

DISBURSEMENTS—*Continued.*

LEGAL—Continued

Amount brought forward			$36,199.26
REAL ESTATE SEARCH, ETC.			
Fees for special information and searches relative to various properties along the routes of proposed additional subway lines in the Boroughs of Manhattan and The Bronx, Brooklyn, and Queens, New York City			14,050.50
SPECIAL COMMISSIONS.			
Compensation for Commissioners appointed by the Appellate Division of the Supreme Court, in and for the First and the Second Judicial Districts, to determine whether certain proposed additional subway lines ought to be constructed and operated in the Boroughs of Manhattan and The Bronx, Brooklyn, and Queens, New York City			36,600.00
COUNSEL.			
Fees		$20,000.00	
Disbursements, viz.:			
Stenography and typewriting	$719.85		
Printing	4,272.09		
Searches and consents	6,448.96		
Additional counsel fees	1,200.00		
Sundry contingent expenses	317.33		
		12,958.23	
			32,958.23
Total Amount of Legal Disbursements			$119,807.99

MANHATTAN-THE BRONX CONSTRUCTION FUND

REQUISITIONS AND APPROPRIATIONS

Statement of Requisitions made upon the Board of Estimate and Apportionment, for the authorization for the issue of Corporate Stock of The City of New York and the Appropriations made by the Board of Estimate and Apportionment, the proceeds thereof to be applied to the requirements of the Manhattan-The Bronx Construction Fund under provision of the contract with *John B. McDonald, Contractor,* dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

No.	Authorized.	Amount.	Appropriation.	Amount.
6.	November 2, 1906. As stated on page 4448 of the minutes of the Rapid Transit Board, viz.:— Extra work—Van Cortlandt Park Extension, Borough of The Bronx, New York City	$675,000.00	November 23, 1906. As stated on page 2943 of the minutes of the Board of Estimate and Apportionment........................	$675,000.00
	Total amount of Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners in the construction of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906................	$675,000.00	Total amount of Appropriations made by the Board of Estimate and Apportionment, the proceeds to be applied to the construction of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906............................	$675,000.00

MANHATTAN-THE BRONX CONSTRUCTION FUND

DISBURSEMENTS.

EXTRA WORK

Statement showing the Requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the Rapid Transit Board to be made to *John B. McDonald, Contractor,* for extra work done and materials furnished under contract dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad of The City of New York, from January 1, 1906, to December 31, 1906.

Requisition.	To Date.	Payments Authorized.		To Whom.	Amount.
	1906	1906			
Attachment of overhead wires to the Rapid Transit Viaduct..	To July 24	September 7	As stated on page 4285 of the minutes of the Rapid Transit Commission..	John B. McDonald, Contractor.......	$6,000.00
Total amount paid to *John B. McDonald, Contractor,* for extra work done and materials furnished under contract dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad from January 1, 1906, to December 31, 1906..........					$6,000.00

DISBURSEMENTS—*Continued.*

REAL ESTATE

Statements showing the Requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the Rapid Transit Board, to be made for Real Estate acquired, for and in behalf of The City of New York, under provision of the contract with *John B. McDonald, Contractor,* dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

DISBURSEMENTS.	AMOUNT.	TOTAL.
ADVERTISING.		
Advertising notices in the matter of the application and petition of the Board of Rapid Transit Railroad Commissioners for the appointment of Commissioners of Appraisal by the Appellate Division of the Supreme Court, First Judicial District, relative to lands situated, viz.: Easements—On Westchester Avenue, Southern Boulevard, and Boston Road, in the Borough of The Bronx, New York City..........	$878.80	
Advertising notices of the filing for confirmation, the (second separate) report of the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, First Judicial District, relative to lands situated viz.: Easements—In Broadway, between West One Hundred and Twenty-second, and West One Hundred and Thirty-fifth Streets, in the Borough of Manhattan, New York City..........	255.60	
		$1,134.40
CLERICAL SERVICE.		
Compensation of the Clerk of the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, First Judicial District, relative to lands situated, viz.: Easements—On Westchester Avenue, Southern Boulevard, and Boston Road, in the Borough of The Bronx, New York City..........	$600.00	
The City of New York—Reimbursement of a fund for expenses of Commissioners of Estimate and Appraisal, for Clerks, etc.; services rendered the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, First Judicial District, relative to lands situated, viz.: Easements—On the westerly side of Fourth Avenue, between Eighth and Ninth Streets, in the Borough of Manhattan, New York City..........	479.43	
Amounts carried forward..........	$1,079.43	$1,134.40

DISBURSEMENTS—*Continued.*

REAL ESTATE—Continued

DISBURSEMENTS.	AMOUNT.	TOTAL.
Amount brought forward	$1,079.43	$1,134.40
Stenographic services rendered the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, First Judicial District, relative to lands situated, viz.:		
Easements—In Broadway, between West One Hundred and Twenty-second and West One Hundred and Thirty-fifth Streets, in the Borough of Manhattan, New York City	65.00	
Easements—On Westchester Avenue, Southern Boulevard and Boston Road, in the Borough of The Bronx, New York City	699.45	
		1,843.88
REAL ESTATE SEARCH.		
Fees for examining titles to various parcels of land situated, viz.:		
Easements—On Westchester Avenue, Southern Boulevard, Boston Road, and on Tenth Avenue, in the Boroughs of Manhattan and The Bronx, New York City	....	2,562.50
COMMISSIONERS OF APPRAISAL.		
Compensation for Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, First Judicial District, relative to lands situated, viz.:		
Easements—In Broadway, between West One Hundred and Twenty-second and West One Hundred and Thirty-fifth Streets, in the Borough of Manhattan, New York City	....	26,000.00
REAL ESTATE.		
Easement properties on Naegle Avenue, between Dyckman and West Two Hundred and Fifth Streets, viz.: payments made for the release and conveyance in perpetuity, pursuant to resolutions adopted by the Rapid Transit Board, of various easements appurtenant to the lands situated on Naegle Avenue, between Dyckman and West Two Hundred and Fifth Streets, in the Borough of Manhattan, N. Y. City	4,500.00	
Easement properties on Tenth Avenue, between West Two Hundred and Fifth and West Two Hundred and Sixteenth Streets, viz.: payments made for the release and conveyance in perpetuity, pursuant to resolutions adopted by the Rapid Transit Board, of various easements appurtenant to the lands situated on Tenth Avenue, between West Two Hundred and Fifth and West Two Hundred and Sixteenth Streets, in the Borough of Manhattan, New York City	13,599.97	
Amounts carried forward	$18,099.97	$31,540.78

DISBURSEMENTS—*Continued.*

REAL ESTATE—Continued

DISBURSEMENTS.	AMOUNT.	TOTAL.
Amounts brought forward	$18,099.97	$31,540.78
Easement properties on Broadway, between West Two Hundred and Sixteenth and West Two Hundred and Thirtieth Streets, viz., payments made for the release and conveyance in perpetuity, pursuant to resolutions adopted by the Rapid Transit Board of various easements appurtenant to the lands situated on Broadway, between West Two Hundred and Sixteenth and West Two Hundred and Thirtieth Streets, in the Borough of Manhattan, New York City	10,085.99	
Easement properties on Westchester Avenue, between Third Avenue and East One Hundred and Fiftieth Street and the Southern Boulevard and East One Hundred and Sixty-sixth Street, viz., payments made for the release and conveyance in perpetuity, pursuant to resolutions adopted by the Rapid Transit Board, of various easements appurtenant to the lands situated on Westchester Avenue, between Third Avenue and East One Hundred and Fiftieth Street and the Southern Boulevard and East One Hundred and Sixty-sixth Street, in The Borough of The Bronx, New York City	4,019.70	
Easement properties on the Southern Boulevard, between East One Hundred and Sixty-sixth Street and East One Hundred and Seventy-fourth streets, viz., payments made for the release and conveyance in perpetuity, pursuant to resolutions adopted by the Rapid Transit Board, of various easements appurtenant to the lands situated on the Southern Boulevard, between East One Hundred and Sixty-sixth and East One Hundred and Seventy-fourth Streets, in the Borough of The Bronx, New York City	6,832.20	
Easement properties on Boston Road, between the Southern Boulevard and East One Hundred and Seventy-fourth Street and East One Hundred and Eighty-first Street, viz., payments made for the release and conveyance in perpetuity, pursuant to resolutions adopted by the Rapid Transit Board, of various easements appurtenant to the lands situated on Boston Road, between the Southern Boulevard and East One Hundred and Seveny-fourth Street and East One Hundred and Eighty-first Street, in the Borough of The Bronx, New York City	7,497.60	
Easement property, northeast corner of Broadway and Forty-second Street, viz., expenditures made in the acquirement of easement property in perpetuity, pursuant to the reports of the Commissioners of Appraisal appointed by the Supreme Court, First Judicial District, relative to lands situated on the northeast corner of Broadway and Forty-second Street, in the Borough of Manhattan, New York City, dated May 15, 1903, and June 23, 1903, and confirmed by orders of said Supreme Court, dated May 18, 1903, and June 25, 1903. Payments made under the direction of the Rapid Transit Board	1,250.00	
	$47,785.46	
REBATEMENT.		
Amount in rental received from tenants leasing and occupying premises in the building situated on the northeast corner of Broadway and Forty-second Street, in the Borough of Manhattan, New York City (leasehold acquired for easement purposes), and transmitted to the City Comptroller	3,616.66	
		$44,168.80
Total amount paid for Real Estate acquired under provision of the contract with John B. McDonald, Contractor, dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906		$75,709.58

BROOKLYN-MANHATTAN CONSTRUCTION FUND

CORPORATE STOCK.

Statement showing the issue of Corporate Stock of The City of New York, from January 1, 1906, to December 31, 1906, the proceeds thereof to be applied to the construction of the Brooklyn-Manhattan Rapid Transit Railroad.

No.	Date of Sale.	Issue.	Interest. Rate.	Maturity.	Issue of Stock.						
					Date.	Rate of Premium.	Amount Issued.	Total.	Amount of Premium.	Total.	Amount of Proceeds Credited.
*6	1906. April 10	$100,000.00	3½%	1955 Nov. 1	1906 April 10		$100,000.00	$100,000.00			$100,000.00
*7	April 27	50,000.00	3½%	Nov. 1	April 27		50,000.00	50,000.00			50,000.00
*8	June 7	50,000.00	3½%	Nov. 1	June 7		50,000.00	50,000.00			50,000.00
*9	July 5	50,000.00	3½%	Nov. 1	July 5		50,000.00	50,000.00			50,000.00
10	July 25	500,000.00	4%	1936 Nov. 1	July 31	.00887%	75,000.00	75,000.00	$665.25	$665.25	75,665.25
					Oct. 2	.00887%	425,000.00	425,000.00	3,769.75	3,769.75	428,769.75
Total Amount of Corporate Stock Issued								$750,000.00			
Total Amount of Premium on the Issue of Corporate Stock										$4,435.00	
Total Amount of Proceeds Applicable to the Construction of the Brooklyn-Manhattan Rapid Transit Railroad of The City of New York, from January 1, 1906, to December 31, 1906											$754,435.00

*Issues of Bonds sold at par value to the Commissioners of the Sinking Fund.

BROOKLYN-MANHATTAN CONSTRUCTION FUND.

DISBURSEMENTS.

Statement showing the Requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the Rapid Transit Board, to be made to *Rapid Transit Subway Construction Company, Contractor*, for work done and materials furnished under contract dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad of The City of New York, from January 1, 1906, to December 31, 1906.

Requisition.	To Date.		Payments Authorized.			To Whom.	Amount.
	1906		1906				
28..........	To January	31	March	1	As stated on page 3927 of the minutes of the Rapid Transit Commission..	Rapid Transit Subway Construction Co.	$43,981.42
29..........	February	28	March	22	As stated on page 3955 of said minutes	" "	38,257.88
30..........	March	31	April	12	" 4025 "	" "	33,289.48
31..........	April	30	May	17	" 4104 "	" "	22,219.61
32..........	May	31	June	21	" 4191 "	" "	22,432.46
33..........	June	30	July	12	" 4261 "	" "	19,301.81
34..........	July	31	September	7	" 4279 "	" "	17,327.88
35..........	August	31	September	20	" 4331 "	" "	22,432.16
36..........	September	30	November	30	" 4500 "	" "	19,993.02
37..........	October	31	November	30	" 4501 "	" "	17,278.52
38..........	November	30	December	27	" 4549 "	" "	31,209.16
			1907				
39..........	December	31	January	17	" 4594 "	" "	26,995.57
Total amount paid to Rapid Transit Subway Construction Company, for work done, and materials furnished under contract dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.....							$314,718.97

DISBURSEMENTS—*Continued*

EXTRA WORK.

Statement showing the Requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the Rapid Transit Board to be made to *Rapid Transit Subway Construction Company, Contractor,* for extra work done and materials furnished under contract dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad of The City of New York, from January 1, 1906, to December 31, 1906.

Requisition.	To Date.		Payments Authorized.			To Whom.	Amount.
	1906		1906				
4..........	To January	31	March	1	As stated on page 3928 of the minutes of the Rapid Transit Commission..	Rapid Transit Subway Construction Co.	$32,557.50
5..........	February	28	March	22	As stated on page 3956 of said minutes	" "	35,497.30
6..........	March	31	April	12	" 4026 "	" "	20,417.70
7..........	April	30	May	17	" 4105 "	" "	41,159.60
8..........	May	31	June	21	" 4192 "	" "	33,548.00
9..........	June	30	July	12	" 4262 "	" "	41,573.40
10..........	July	31	September	7	" 4280 "	" "	44,596.80
11..........	August	31	September	20	" 4332 "	" "	22,854.70
12..........	September	30	October	18	" 4407 "	" "	46,178.35
13..........	October	31	November	30	" 4502 "	" "	60,754.95
14..........	November	30	December	27	" 4550 "	" "	40,038.05
			1907				
15..........	December	31	January	17	" 4595 "	" "	37,905.52
Total amount paid to Rapid Transit Subway Construction Comapny, Contractor, for extra work done and materials furnished under contract dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad from January 1, 1906, to December 31, 1906							$457,081.87

DISBURSEMENTS—*Continued.*

REAL ESTATE

Statement showing the Requisitions made upon the Board of Rapid Transit Railroad Commissioners, and the payments authorized under the direction of the Rapid Transit Board, to be made for Real Estate acquired, for and in behalf of the City of New York, under provision of the contract with *Rapid Transit Subway Construction Company, Contractor,* dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

DISBURSEMENTS.	AMOUNT.	TOTAL.
ADVERTISING		
Advertising notices in the matter of the application and petition of the Board of Rapid Transit Railroad Commissioners, for the appointment of Commissioners of Appraisal by the Appellate Division of the Supreme Court, Second Judicial District, relative to acquiring real property, rights, franchises, easements, or privileges, situated, viz.:		
Easements—Lands under Joralemon and other streets in the Borough of Brooklyn, New York City (relative to amending the application heretofore made)........	$370.24	
Estate in Fee—Triangular parcel of land, bounded by Flatbush, Fourth and Atlantic Avenues, in the Borough of Brooklyn, New York City........	222.56	
Advertising notices of the sittings of the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated, viz.:		
Easements—Lands under Joralemon and other streets in the Borough of Brooklyn, New York City..	129.60	
Advertising notices of the filing for confirmation, reports of the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated, viz.:		
Easements—Lands under Joralemon and other streets in the Borough of Brooklyn, New York City...	159.36	
		$881.76
EXPERT SERVICE.		
Compensation for Experts in the matter of testimony before Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated, viz.:		
Easements—Under Joralemon and other streets in the Borough of Brooklyn, New York City........	....	475.00
Amount carried forward........	....	$1,356.76

DISBURSEMENTS—*Continued.*

REAL ESTATE—Continued

DISBURSEMENTS.	AMOUNT.	TOTAL.
Amount brought forward		$1,356.76
CLERICAL SERVICE.		
Compensation of the Clerk of the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated, viz.:		
Easements—Lands under Joralemon and other streets, in the Borough of Brooklyn, New York City	$1,200.00	
The City of New York—Reimbursement of a fund for expenses of Commissioners of Estimate and Appraisal for Clerks, etc.; services rendered the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated viz.:		
Easements—Lands under Joralemon and other streets, in the Borough of Brooklyn, New York City	1,196.61	
Easements—Lands at Joralemon and Furman streets, in the Borough of Brooklyn, New York City	712.04	
Stenographic services rendered the Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated, viz.:		
Easements—Lands under Joralemon and other streets, in the Borough of Brooklyn, New York City	1,241.35	
		4,350.00
COMMISSIONERS OF APPRAISAL.		
Compensation for Commissioners of Appraisal appointed by the Appellate Division of the Supreme Court, Second Judicial District, relative to lands situated, viz.:		
Easements—Under Joralemon and other streets, in the Borough of Brooklyn, New York City		2,570.00
REAL ESTATE.		
Easement Property (Rights, Privileges, etc.), northwest corner of Fulton and Bridge streets, viz.: payment made for the release and conveyance in perpetuity, pursuant to an agreement made with Messrs. Strauss and Charig, of the easements appurtenant to the land situated at the northwest corner of Fulton and Bridge streets, in the Borough of Brooklyn, New York City		900.00
Total amount paid for Real Estate acquired under provision of the contract with *Rapid Transit Subway Construction Company, Contractor*, dated July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906		$9,176.76

DISBURSEMENTS—*Continued*

INTEREST ON CORPORATE STOCK

Statement showing the payments made under the direction of the City Comptroller, for interest due on the Corporate Stock issued by The City of New York, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906.

No.	For What.	Due.	Amount.
6	The payment of interest due on the Corporate Stock issued by The City of New York, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad.............	May 1, 1906...	$27,607.92
7	The payment of interest due on the Corporate Stock issued by The City of New York, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad.............	Nov. 1, 1906...	36,367.64
	Total amount in interest paid on the Corporate Stock issued by The City of New York, for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad from January 1, 1906, to December 31, 1906...............................	....	$63,975.56

GENERAL FUND

BALANCES

Statement showing the yearly balances of the General Fund, 1905-1906.

Year.	Appropriations.		Disbursements.	Excess Disbursements chargeable to the unexpended balance of previous appropriations.	Surplus applicable with the current appropriation.
		UNEXPENDED BALANCE, 1905.			
1905	$41,644.60	Unexpended Balance of the General Fund, December 31, 1905..	....	....	$41,644.60
		APPROPRIATIONS, 1906.			
1906	731,160.00	Appropriations made by the Board of Estimate and Apportionment for the purposes of the Board of Rapid Transit Railroad Commissioners, from January 1, 1906, to December 31, 1906..	....	....	....
		DISBURSEMENTS, 1906.			
1906	....	Administrative and General Office................$45,384.68 Engineering ....586,503.74 Legal 119,807.99	$751,696.41	$20,536.41	....
		UNEXPENDED BALANCE, 1906.			
1906	....	Unexpended Balance of the General Fund, December 31, 1906..	21,108.19	21,108.19	....
	$772,804.60		$772,804.60	$41,644.60	$41,644.60

MANHATTAN-THE BRONX CONSTRUCTION FUND

BALANCES

Statement showing the yearly balances of the Manhattan-The Bronx Construction Fund, 1905-1906.

Year.	Amount of Proceeds of Corporate Stock Issued.			Disbursements.	Excess Disbursements Chargeable to the Unexpended Balance of Previous Appropriations.	Surplus Applicable with the Proceeds of the Current Stock Issue.
		UNEXPENDED BALANCES, 1905.				
1905	$520,750.49	Unexpended Balance of the Manhattan-The Bronx Construction Fund, December 31, 1905				$520,750.49
		CORPORATE STOCK, 1906.				
1906		Amount of Proceeds of Corporate Stock issued by The City of New York for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, from January 1, 1906, to December 31, 1906				
		DISBURSEMENTS, 1906.				
1906		Disbursements, viz., Manhattan-The Bronx Rapid Transit Railroad:—				
		For Extra Work done and materials furnished	$6,000.00			
		For Real Estate	75,709.58	$81,709.58	$81,709.58	
		UNEXPENDED BALANCE, 1906.				
1906		Unexpended Balance of the Manhattan-The Bronx Construction Fund, December 31, 1906		439,040.91	439,040.91	
	$520,750.49			$520,750.49	$520,750.49	$520,750.49

BROOKLYN-MANHATTAN CONSTRUCTION FUND

BALANCES

Statement showing the yearly balances of the Brooklyn-Manhattan Construction Fund, 1905-1906.

Year.	Amount of Proceeds of Corporate Stock Issued.			Disbursements.	Excess Disbursements Chargeable to the Unexpended Balance of Previous Appropriations.	Surplus Applicable with the Proceeds of the Current Stock Issue.
		Unexpended Balances, 1905.				
1905	$111,124.07	Unexpended Balance of the Brooklyn-Manhattan Construction Fund, December 31, 1905				$111,124.07
		Corporate Stock, 1906.				
1906	754,435.00	Amount of Proceeds of Corporate Stock issued by The City of New York for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad, from January 1, 1906, to December 31, 1906				
		Disbursements, 1906.				
1906		Disbursements, viz., Brooklyn-Manhattan Rapid Transit Railroad:—				
		For Work done and materials furnished	$314,718.97			
		For Extra Work done and materials furnished	457,081.87			
		For Real Estate	9,176.76			
		For Interest on the Corporate Stock	63,975.56			
				$844,953.16	$90,518.16	
		Unexpended Balance, 1906.				
1906		Unexpended Balance of the Brooklyn-Manhattan Construction Fund, December 31, 1906		20,605.91	20,605.91	
	$865,559.07			$865,559.07	$111,124.07	$111,124.07

MANHATTAN-THE BRONX CONTRACT.

SECURITY.

Statement of the Security deposited by *John B. McDonald, Contractor, and Interborough Rapid Transit Company,* under provision of the contract of February 21, 1900, and the agreements amendatory thereof and supplemental thereto, for the construction, maintenance and operation of the Manhattan-The Bronx Rapid Transit Railroad, remaining in the custody of The City of New York, December 31, 1906.

Bond:—For Construction and Equipment, deposited with the City Comptroller February 21, 1900. . . . $5,000,000.

SURETIES.

The Rapid Transit Subway Construction Company of New York, $4,000,000.

The United States Fidelity and Guaranty Company of Maryland, $250,000.

*The Empire State Surety Company of New York, $250,000.

The American Surety Company of New York, $250,000.

The National Surety Company of New York, $250,000.

Bond:—(continuing). For Rental and also for Construction deposited (substituted) with the City Comptroller January 14, 1904. . . . . $1,000,000.

SURETIES.

Fidelity and Deposit Company of Maryland, $500,000.

United States Fidelity and Guaranty Company of Maryland, $500,000.

Bonds of the Sub-Contractors for Construction, assigned to The City of New York as additional security by John B. McDonald, Contractor, and deposited with the Rapid Transit Board, aggregating . . . . $3,378,250.

CITY LIEN ON EQUIPMENT.

The City shall also have a first lien upon the Equipment of the Railroad, as further security for the faithful performance by the Contractor of the covenants, conditions and agreements of the contract of February 21, 1900, and the agreements amendatory thereof and supplemental thereto. Such lien shall arise immediately upon the acquisition by the Contractor of any part of the Equipment for use on or in connection with the said Railroad or any part of it, or intended for such use, whether or not such equipment be set up or delivered upon or at the railway.

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*Substituted in lieu of The City Trust, Safe Deposit and Surety Company of Philadelphia, Pa., July 28, 1906.

BROOKLYN-MANHATTAN CONTRACT.
SECURITY.

Statement of the Security deposited by *Rapid Transit Subway Construction Company, Contractor,* under provision of the contract of July 21, 1902, and the agreements amendatory thereof and supplemental thereto, for the construction, maintenance and operation of the Brooklyn-Manhattan Rapid Transit Railroad, remaining in the custody of The City of New York, December 31, 1906.

Amount in Cash:—For Construction pursuant to the Contract, deposited with the City Chamberlain September 11, 1902..........................$1,000,000.

Bond:—(continuing). For Rental and also for Construction deposited (substituted) with the City Comptroller February 10, 1905.................$1,000,000.

SURETIES.

United States Fidelity and Guaranty Company of Maryland, **$250,000.**
Fidelity and Deposit Company of Maryland, **$250,000.**
The National Surety Company of New York, **$250,000.**
The Aetna Indemnity Company of Connecticut, **$100,000.**
The Empire State Surety Company of New York, **$150,000.**

Bond of the Sub-Contractors for Construction, assigned to The City of New York as additional security by Rapid Transit Subway Construction Company, Contractor, and deposited with the Rapid Transit Board, aggregating.............. $650,000.

CITY LIEN ON EQUIPMENT.

"The City shall also have a first lien upon the equipment of the Railroad as further security for the faithful performance by the Contractor of the covenants, conditions and agreements of the contract of July 21, 1902, and the agreements amendatory thereof and supplemental thereto. Such lien shall arise immediately upon the acquisition by the Contractor of any part of the equipment for use on or in connection with the said railroad or any part of it, or intended for such use, whether or not such equipment be set up or delivered upon or at the railway."

RAPID TRANSIT RAILROAD RENTAL

MANHATTAN-THE BRONX.

Statement showing the payments made under the direction of the City Comptroller for interest due on the Corporate Stock issued by The City of New York for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad, and the Rental received by the City Comptroller from Interborough Rapid Transit Company under a lease by The City of New York of the Manhattan-The Bronx Rapid Transit Railroad constructed under the contract with *John B. McDonald, Contractor*, dated February 21, 1900, and the agreements amendatory thereof and supplemental thereto assigned to the Interborough Rapid Transit Company, from January 1, 1906, to December 31, 1906.

Due.	Date Received.	Rental.			
		From	Payments to the Sinking Fund.	For Interest on Corporate Stock.	Total.
	1905	Amount in Rental received by the City Comptroller from Interborough Rapid Transit Company to December 31, 1905	....	$1,137,978.63	$1,137,978.63
1905 Nov. 1..	1906 May 25	Interborough Rapid Transit Co.	$384,576.79		
1906 Jan. 1..	Jan. 31	"	....	$334,257.55	
Apr. 1..	Apr. 30	"	....	341,816.27	
July 1..	July 30	"	....	370,186.22	
Oct. 1..	Oct. 30	"	....	370,086.54	
Nov. 1..	Dec. 7	"	$425,799.78	....	
Total amounts in Rental received by the City Comptroller from Interborough Rapid Transit Company under a lease by The City of New York of the Manhattan-The Bronx Rapid Transit Railroad to December 31, 1906........................			$810,376.57	$1,416,346.58	2,226,723.15
					$3,364,701.78

Interest on Corporate Stock				
No.	For What.	Due.	Amount.	Total.
	Amount in interest paid by the City Comptroller to December 31, 1905	1905	$775,982.75	$775,982.75
12	The payments of interest due on the Corporate Stock issued by The City of New York for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad	1906 May 1	$774,418.75	
13		Nov. 1	774,418.75	
	Amount in interest paid by the City Comptroller on the Corporate Stock issued by The City of New York for the construction and operation of the Manhattan-The Bronx Rapid Transit Railroad to December 31, 1906.....	....	....	$1,548,837.50
				$2,324,820.25

RAPID TRANSIT RAILROAD RENTAL

BROOKLYN-MANHATTAN.

tement showing the payments made under the direction of the City Comptroller for interest due on the Corporate ssued by The City of New York for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railnd the Rental received by the City Comptroller from Interborough Rapid Transit Company under a lease by The New York of the Brooklyn-Manhattan Rapid Transit Railroad constructed under the contract with *Rapid Transit Construction Company, Contractor,* dated July 21, 1902, and the agreements amendatory thereof and supplemental assigned to the Interborough Rapid Transit Company, from January 16, 1905, to December 31, 1906.

Date Received.	Rental.				Interest on Corporate Stock.				
	From	Payments to the Sinking Fund.	For Interest on Corporate Stock.	Total.	No.	For What.	Due.	Amount.	Total.
1906 Apr. 11	Interborough Rapid Transit Co.	....	$9,783.48		6	*The payments of interest due on the Corporate Stock issued by The City of New York for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad	1906 May 1	....	
Apr. 30	"	....	4,598.17						
July 30	"	....	4,598.17						
Dec. 7	"	$5,255.29	....						
Oct. 30	"	....	4,740.05		7		Nov. 1	....	
tal amounts in Rental received by the City Comptroller from Interborough Rapid Transit Company under a lease by The City of New York of the Brooklyn-Manhattan Rapid Transit Railroad to December 31, 1906..................		$5,255.29	$23,719.87	$28,975.16		*Amount in interest paid by the City Comptroller on the Corporate Stock issued by The City of New York for the construction and operation of the Brooklyn-Manhattan Rapid Transit Railroad to December 31, 1906.....	....	....	....

ie amount of interest on the Corporate Stock issued, due May 1, 1906, and November 1, 1906, was applied to the "Interest on Corporate Stock" account, Manhattan Construction Fund disbursements.

RECAPITULATION

Board of Rapid Transit Railroad Commissioners

GENERAL FUND, 1894-1906.

REQUISITIONS AND APPROPRIATIONS

Total amount of Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners during the period of:—			Total amount of Appropriations made by the Board of Estimate and Apportionment for the purposes of the Board of Rapid Transit Railroad Commissioners during the period of:—	
1894. Amount of Requisitions....		$5,000.00	1894. Amount of Appropriations..........	$5.000.00
1895. " " "	$89,434.75		1895. " " "	53,795.88
Aggregate appropriation made by the Board of Estimate and Apportionment in excess of the amount of the original requisitions	1,816.31	91,251.06		
1896. Amount of Requisitions....		66,947.93	1896. " " "	102,135.60
1897. " " "	$94,482.21	....	1897. " " "	66,009.59
Aggregate appropriation made by the Board of Estimate and Apportionment reduced to suffice the purposes of the original requisitions..................	14,433.04	80,049.17		
1898. Amount of Requisitions....	$42,943.37		1898. " " "	53,380.91
Aggregate appropriation made by the Board of Estimate and Apportionment reduced to suffice the purposes of the original requisitions..................	5,869.55	37,073.82		
1899. Amount of Requisitions....		27,625.33	1899. " " "	27,625.33
1900. " " "		246,393.28	1900. " " "	246,393.28
1901. " " "		423,521.60	1901. " " "	423,521.60
1902. " " "		613,500.00	1902. " " "	613,500.00
1903. " " "	$572,000.00		1903. " " "	542,000.00
Re-appropriation. No bonds to be issued.	30,000.00	542,000.00		
1904. Amount of Requisitions....		576,000.00	1904. " " "	576,000.00
1905. " " "		640,605.00	1905. " " "	640,605.00
1906. " " "		731,160.00	1906. " " "	731,160.00
Total amount of Requisitions made upon the Board of Estimate and Apportionment for the General Fund from 1894 to 1906, inclusive		$4,081.127.19	Total Amount of Appropriations to the General Fund from 1894 to 1906, inclusive	$4,081,127.19

GENERAL FUND, 1894-1906.

DISBURSEMENTS

Total amount of Disbursements made under the direction of the Board of Rapid Transit Railroad Commissioners during the period of—	Administrative, and General Office.	Engineering.	Legal.	Total.
..1894. Amount of Disbursements.......	$2,929.10	$1,271.34	28.30	$4,228.74
..1895. “ “ “	6,048.49	26,250.29	25,688.13	57,986.91
..1896. “ “ “	35,572.34	17,028.82	31,457.53	84,058.69
..1897. “ “ “	5,230.06	21,395.86	38,925.73	65,551.65
..1898. “ “ “	4,521.15	17,930.31	29,519.13	51,970.59
..1899. “ “ “	2,826.94	3,698.00	20,551.30	27,076.24
..1900. “ “ “	53,866.33	161,047.23	27,356.19	242,269.75
..1901. “ “ “	39,023.86	348,258.30	31,861.62	419,143.78
..1902. “ “ “	45,576.10	458,389.79	33,547.26	537,513.15
..1903. “ “ “	45,719.42	520,664.27	24,332.55	590,716.24
..1904. “ “ “	57,965.11	530,936.37	27,446.87	616,348.35
..1905. “ “ “	48,945.59	513,535.00	48,977.91	611,458.50
..1906. “ “ “	45,384.68	586,503.74	119,807.99	751,696.41
	$393,609.17			
		$3,206,909.32		
			$459,500.51	
Total amount of General Fund Disbursements, from 1894 to 1906, inclusive.................				$4,060,019.00

CONSTRUCTION FUNDS, 1894-1906

REQUISITIONS AND APPROPRIATIONS.

MANHATTAN-THE BRONX CONSTRUCTION FUND.

Total amount of the Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners during the period:—

Year	Requisitions	Item	Amount
1900.	Amount of the Requisitions: Construction	$35,000,000.00	
	Terminals	1,000,000.00	
	Real Estate	500,000.00	$36,500,000.00
1901.	Amount of the Requisitions		....
1902.	"		....
1903.	" Extra Work		3,000,000.00
1904.	Amount of the Requisitions: Real Estate	$1,500,000.00	
	Terminals	750,000.00	
	Extra Work and for Ducts	1,500,000.00	3,750,000.00
1905.	Amount of the Requisitions: Interest on Corporate Stock		2,965,392.65
1906.	" Extra Work, Van Cortlandt Park extension		675,000.00

Total amount of the Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners in the construction of the Manhattan-The Bronx Rapid Transit Railroad from 1900 to 1906, inclusive $46,890,392.65

Total amount of the Appropriations made by the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners during the period:—

Year	Appropriations	Amount
1900.	Amount of the Appropriations	$36,500,000.00
1901.	"	....
1902.	"	....
1903.	"	3,000,000.00
1904.	"	3,750,000.00
1905.	"	2,965,392.65
1906.	"	675,000.00

Total amount of the Appropriations made by the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners in the construction of the Manhattan-The Bronx Rapid Transit Railroad from 1900 to 1906, inclusive $46,890,392.65

BROOKLYN-MANHATTAN CONSTRUCTION FUND.

Total amount of the Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners during the period:—

Year	Requisitions	Item	Amount
1902.	Amount of the Requisitions: Construction	$2,000,000.00	
	Terminals and Real Estate	1,000,000.00	$3,000,000.00
1903.	Amount of the Requisitions		....
1904.	"		....
1905.	" Extra Work		1,620,000.00
1906.	" Requisitions		....

Total amount of the Requisitions made upon the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners in the construction of the Brooklyn-Manhattan Rapid Transit Railroad from 1902 to 1906, inclusive $4,620,000.00

Total amount of the Appropriations made by the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners during the period:—

Year	Appropriations	Amount
1902.	Amount of the Appropriations	$3,000,000.00
1903.	"	....
1904.	"	....
1905.	"	1,620,000.00
1906.	"	....

Total amount of the Appropriations made by the Board of Estimate and Apportionment for the requirements of the Board of Rapid Transit Railroad Commissioners in the construction of the Brooklyn-Manhattan Rapid Transit Railroad from 1902 to 1906, inclusive $4,620,000.00

CORPORATE STOCK

1894-1906.

MANHATTAN-THE BRONX CONSTRUCTION FUND

Total amount of Proceeds credited of the Corporate Stock issued by The City of New York for the construction of the Manhattan-The Bronx Rapid Transit Railroad during the period of:—		Proceeds.
1900. Amount of Stock issued	$1,000,000.00	
" " Premium	105,400.00	
		$1,105,400.00
1901. Amount of Stock issued	$11,000,000.00	
" " Premium	635,361.46	
		11,635,361.46
1902. Amount of Stock issued	$12,500,000.00	
" " Premium	803,663.70	
		13,303,663.70
1903. Amount of Stock issued	$11,865,000.00	
" " Premium	237,487.72	
		12,102,487.72
1904. Amount of Stock issued	$5,885,000.00	
" " Premium	82,938.37	
		5,967,938.37
1905. Amount of Stock issued	$2,300,000.00	
" " Premium	16,391.10	
		2,316,391.10
1906. Amount of Stock issued	....	....
Total amount of Proceeds applicable to the construction of the Manhattan-The Bronx Rapid Transit Railroad from 1900 to 1906, inclusive		$46,431,242.35

BROOKLYN-MANHATTAN CONSTRUCTION FUND

Total amount of Proceeds credited of the Corporate Stock issued by The City of New York for the construction of the Brooklyn-Manhattan Rapid Transit Railroad during the period of:—		
1903. Amount of Stock issued	$301,000.00	
" " Premium	715.29	
		$301,715.29
1904. Amount of Stock issued	$1,065,000.00	
" " Premium	15,359.13	
		1,080,359.13
1905. Amount of Stock issued	$200,000.00	
" " Premium	1,425.32	
		201,425.32
1906. Amount of Stock issued	$750,000.00	
" " Premium	4,435.00	
		754,435.00
Total amount of Proceeds applicable to the construction of the Brooklyn-Manhattan Rapid Transit Railroad from 1902 to 1906, inclusive		$2,337,934.74

CONSTRUCTION FUNDS, 1894-1906

DISBURSEMENTS

MANHATTAN-THE BRONX CONSTRUCTION FUND.

Total amount of Disbursements made in the construction of the Manhattan-The Bronx Rapid Transit Railroad during the period:—	Work and Materials.	Extra Work and Materials.	Terminals.	Real Estate.	Interest on Corporate Stock.	Total.
1900, Amount of Disbursements...	$1,685,000.00	....	....	....	....	$1,685,000.00
1901, " " ...	10,343,000.00	$162,000.00	....	$9,515.45	$165,013.90	10,679,529.35
1902, " " ...	11,436,000.00	631,000.00	....	141,391.72	547,031.41	12,755,423.13
1903, " " ...	6,930,000.00	2,563,021.47	$1,048,251.72	512,004.90	947,481.56	12,000,759.65
1904, " " ...	3,220,000.00	932,304.61	701,748.28	863,195.62	1,305,865.78	7,023,114.29
1905, " " ...	869,000.00	4,950.00	....	163,622.76	†729,092.68	1,766,665.44
1906, " " ...	....	6,000.00	....	75,709.58	*..........	81,709.58
	$34,483,000.00	$4,299,276.08	$1,750,000.00	$1,765,440.03	$3,694,485.33	
Total amount of Manhattan-The Bronx Construction Fund Disbursements from 1900 to 1906, inclusive........						$45,992,201.44

BROOKLYN-MANHATTAN CONSTRUCTION FUND.

Total amount of Disbursements made in the construction of the Brooklyn-Manhattan Rapid Transit Railroad during the period:—	Work and Materials.	Extra Work and Materials.	Real Estate.	Interest on Corporate Stock.	Total.
1903, Amount of Disbursements..................	$202,457.06	....	$706.80	$5.87	$203,169.73
1904, " "	620,425.62	....	1,200.00	20,196.40	641,822.02
1905, " "	491,504.53	$82,895.00	2,450.80	50,533.59	627,383.92
1906, " "	314,718.97	457,081.87	9,176.76	63,975.56	844,953.16
	$1,629,106.18	$539,976.87	$13,534.36	$134,711.42	
Total amount of Brooklyn-Manhattan Construction Fund Disbursements from 1902 to 1906, inclusive					$2,317,328.83

†An additional amount of interest on the Corporate Stock issued, due November 1, 1905, $775,982.75 was applied to the "*Rapid Transit Railroad, Rental*" account, Manhattan and The Bronx.

*The total amount of interest on the Corporate Stock issued, due May 1, 1906, and November 1, 1906, was applied to the "*Rapid Transit Railroad, Rental*" account, Manhattan and The Bronx.

Board of Rapid Transit Railroad Commissioners

THE CITY OF NEW YORK

SUMMARY OF DISBURSEMENTS

1894-1906.

Total amount of General Fund Disbursements............	$4,060,019.00
Total amount of Manhattan-The Bronx Construction Fund Disbursements	45,992,201.44
Total amount of Brooklyn-Manhattan Construction Fund Disbursements	2,317,328.83
Total amount disbursed by the Board of Rapid Transit Railroad Commissioners, from June 18, 1894, to December 31, 1906....................................	$52,369,549.27

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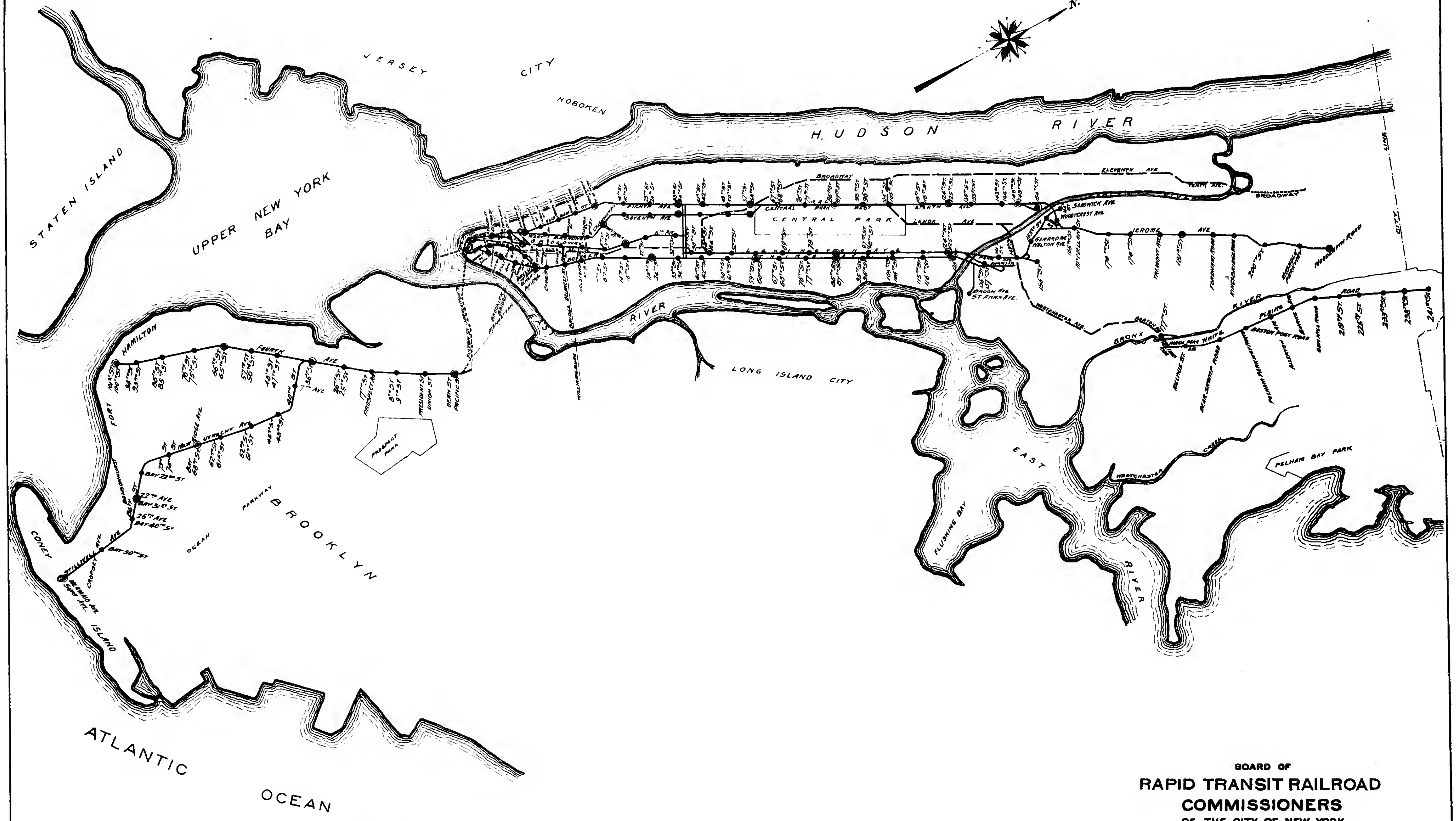


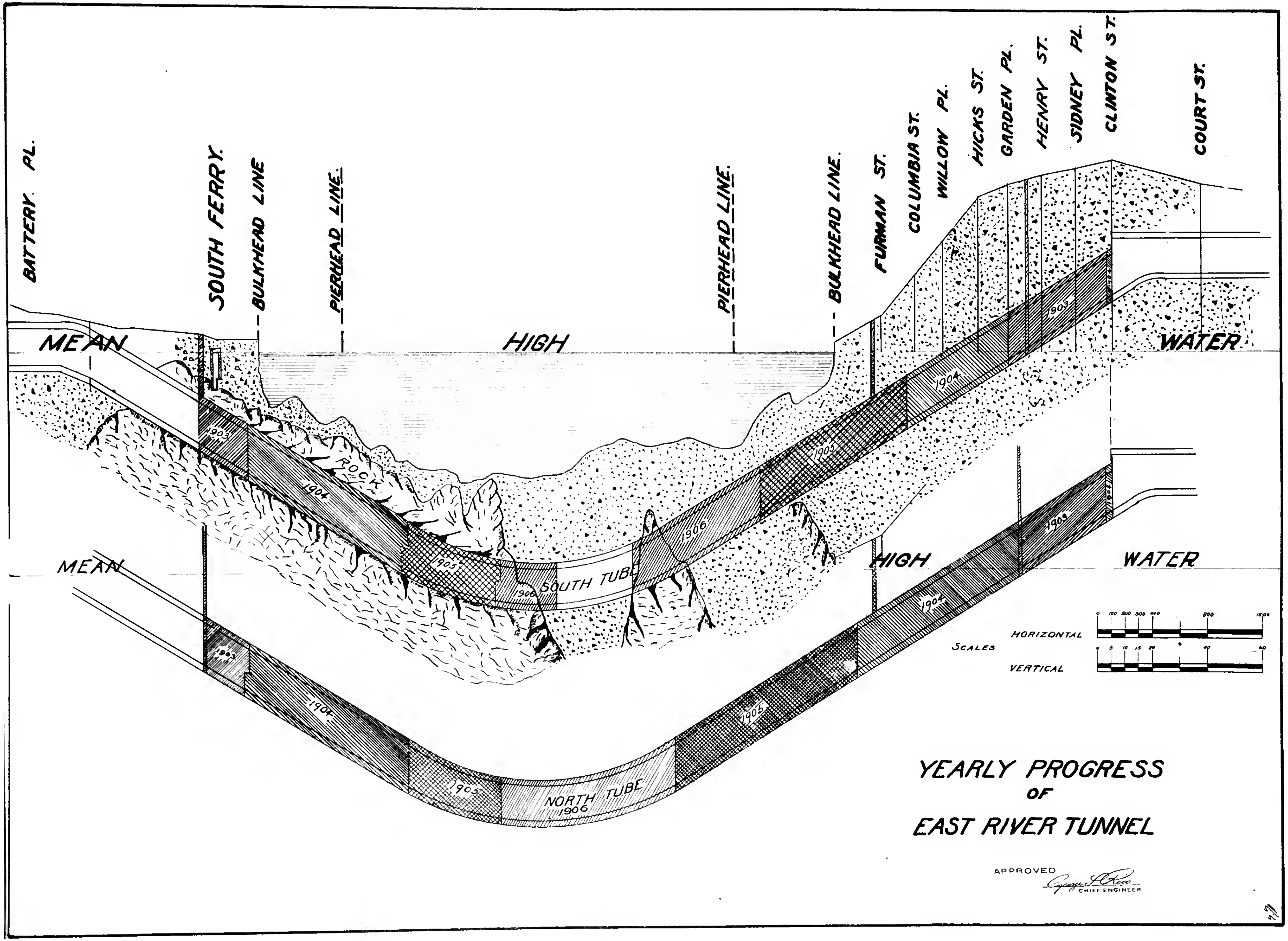
APPROVED George S. Rice
CHIEF ENGINEER

BOARD OF

RAPID TRANSIT RAILROAD
COMMISSIONERS

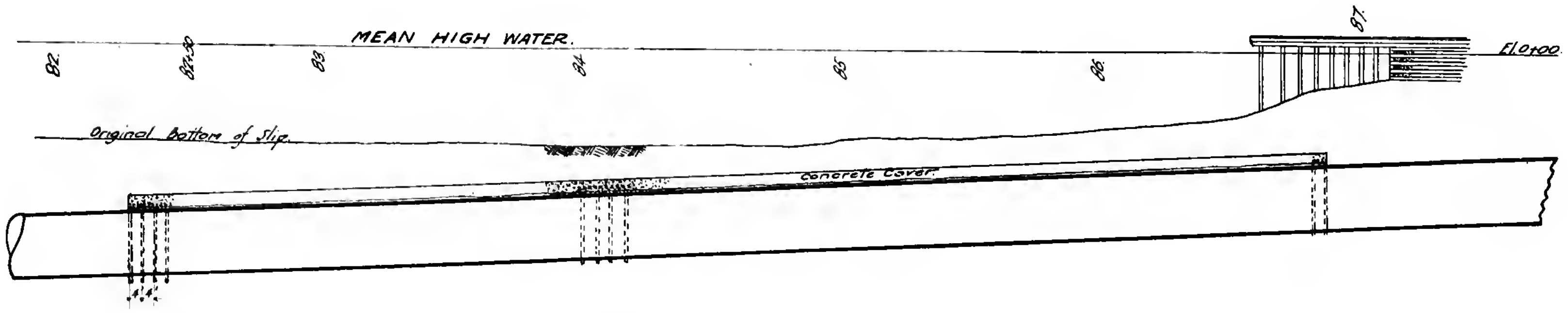
OF THE CITY OF NEW YORK.

MAP SHOWING ADDITIONAL RAPID TRANSIT LINES WITH STATIONS APPROVED BY THE BOARD



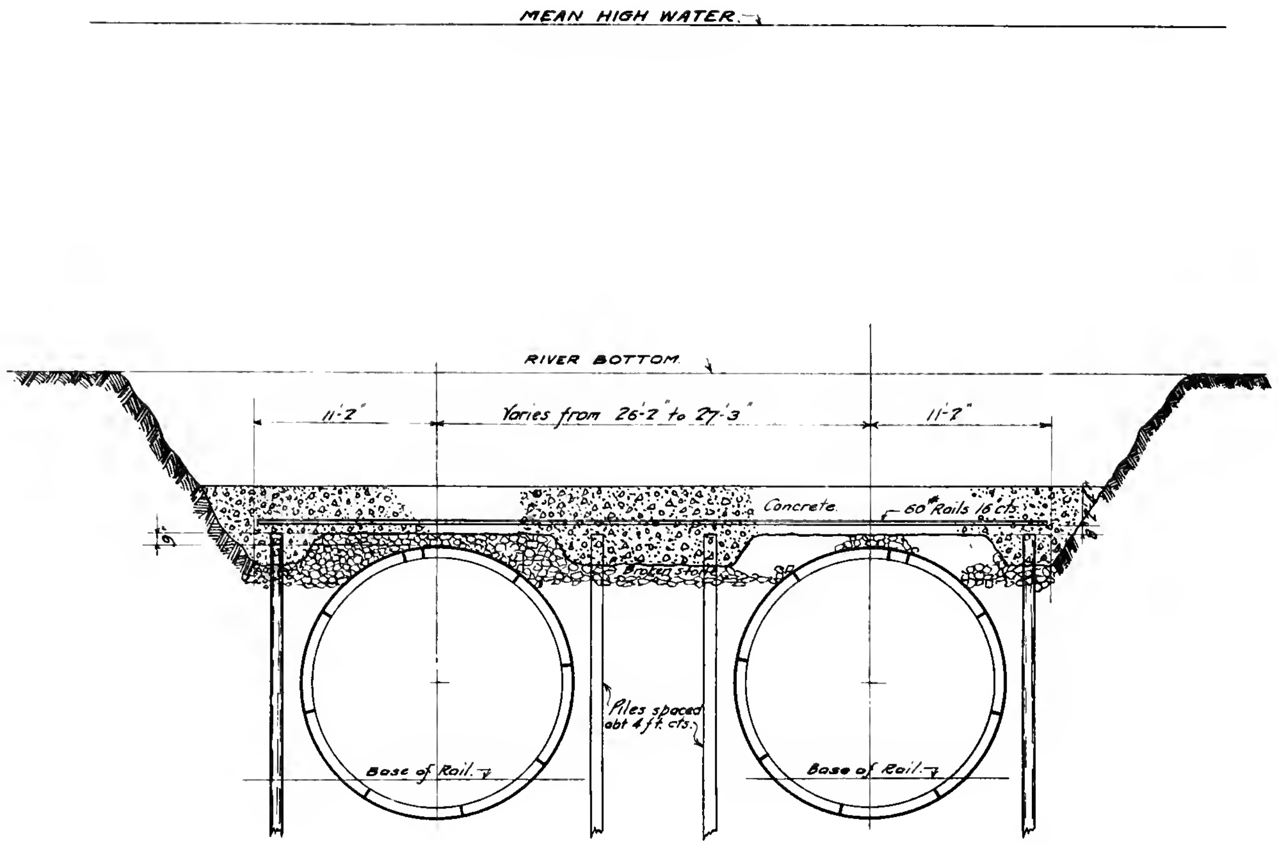
YEARLY PROGRESS
OF
EAST RIVER TUNNEL

APPROVED
George S. Rice
CHIEF ENGINEER



PROFILE.

SCALE {HORIZONTAL 0 15 30 60 90
{VERTICAL 0 10 20 40 60



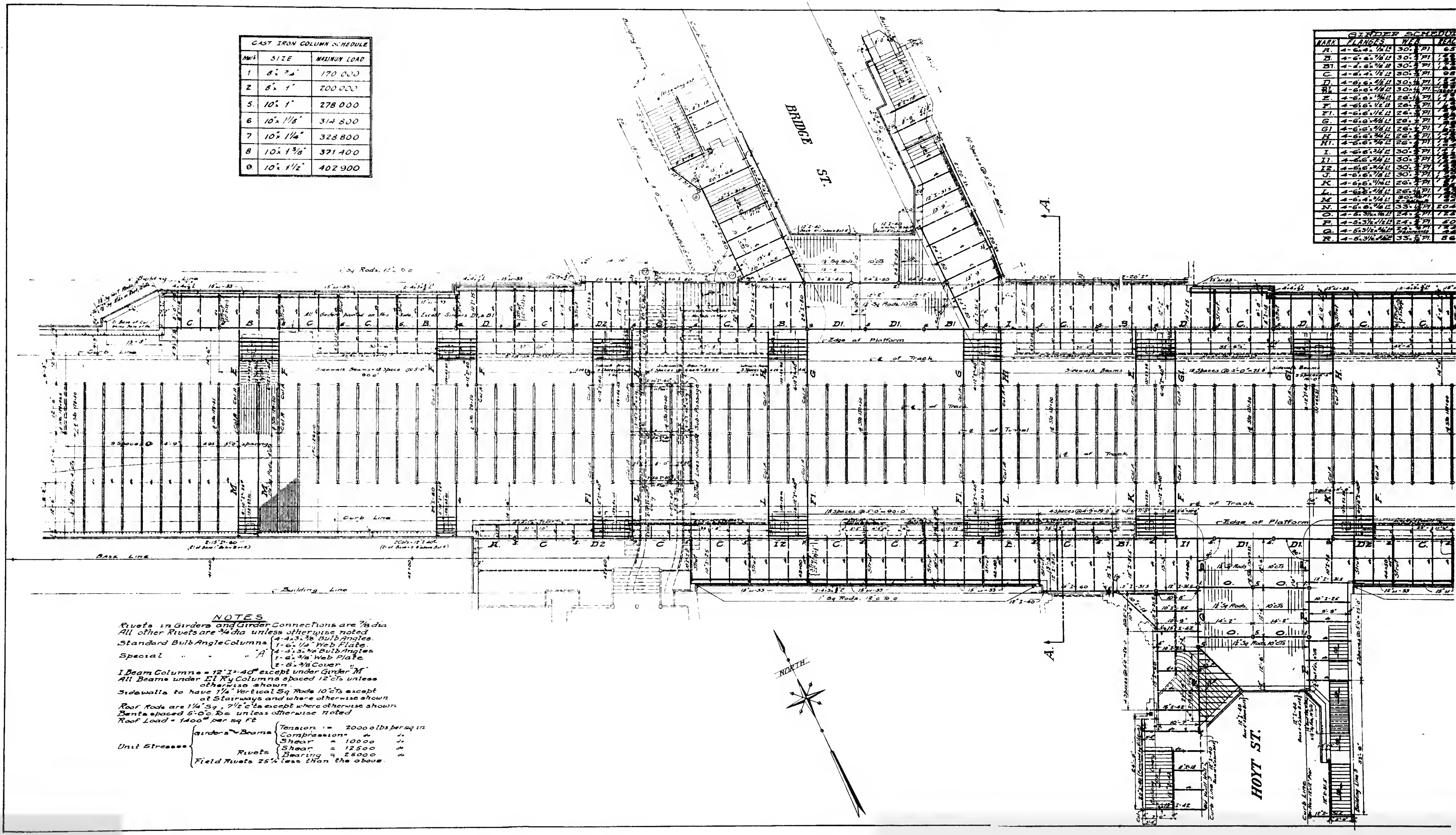
SECTION.

SCALE 0 5 10 15

EAST RIVER TUNNEL.

COVER OVER TUBES, UNDER PROPERTY OF N.Y. DOCK CO.

APPROVED George S. Rice
CHIEF ENGINEER.

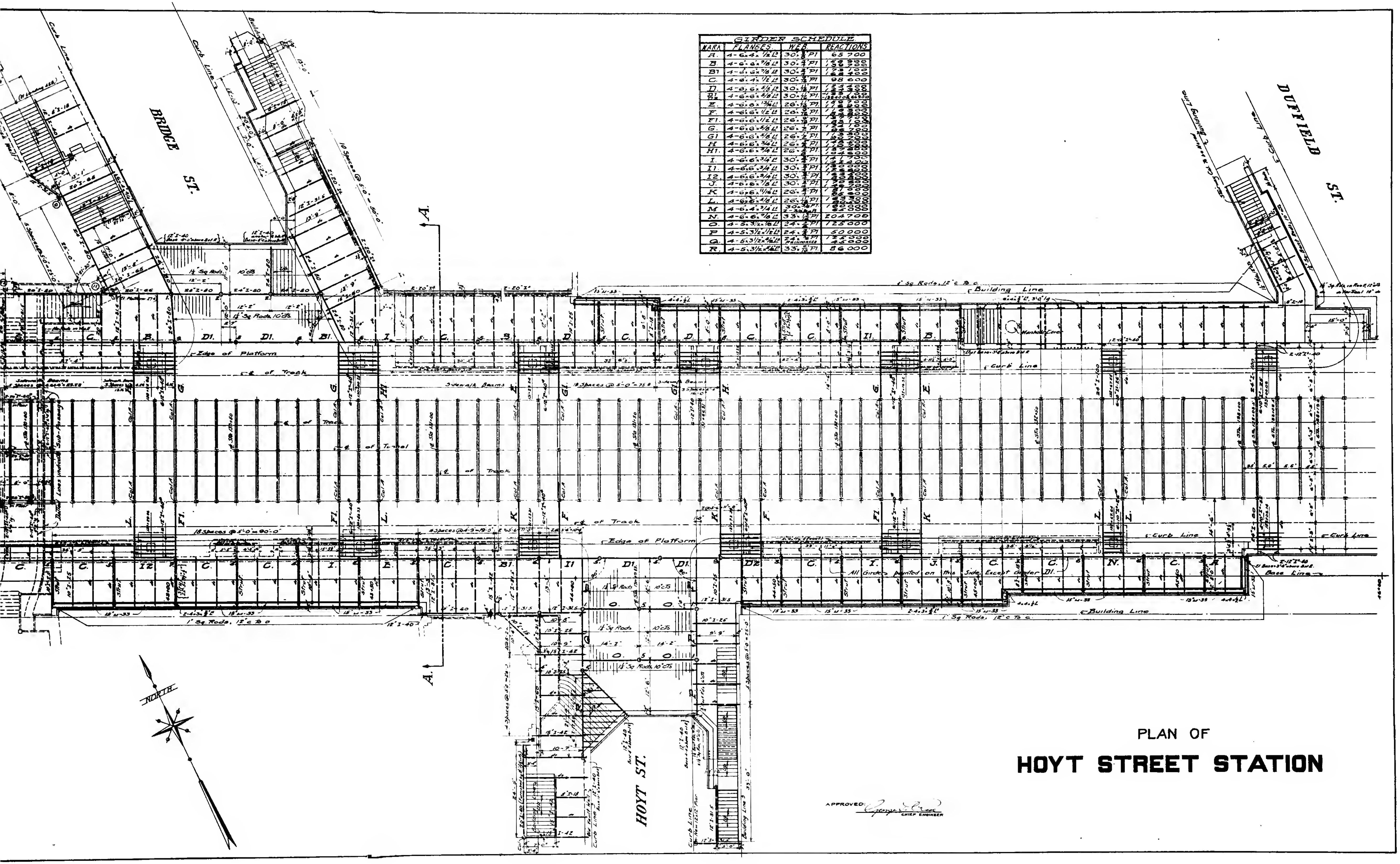


CAST IRON COLUMN SCHEDULE		
Mark	SIZE	MAXIMUN LOAD
1	8"× 3/4"	170 000
2	8"× 1"	200 000
5.	10"× 1"	278 000
6	10"× 1 1/8"	314 800
7	10"× 1 1/4"	328 800
8	10"× 1 3/8"	371 400
9.	10"× 1 1/2"	402 900

GIRDER SCHEDU			
MARK	FLANGES	WEB.	REAC
A.	4-6×4×½ L^s	30×3/8 Pl.	65
B.	4-6×6×7/8 L^s	30×3/8 Pl.	[illegible]
B1.	4-6×6×7/8 L^s	30×3/8 Pl.	[illegible]
C.	4-6×4×½ L^s	30×3/8 Pl.	98
D.	4-6×6×5/8 L^s	30×7/16 Pl.	[illegible]
D1. D2.	4-6×6×5/8 L^s	30×7/16 Pl.	[illegible]
E.	4-6×6×13/16 L^s	26×7/16 Pl.	[illegible]
F.	4-6×6×½ L^s	26×3/8 Pl.	[illegible]
F1.	4-6×6×½ L^s	26×3/8 Pl.	[illegible]
G.	4-6×6×5/8 L^s	26×½ Pl.	[illegible]
G1	4-6×6×5/8 L^s	26×½ Pl.	[illegible]
H	4-6×6×3/4 L^s	26×½ Pl.	[illegible]
H1.	4-6×6×3/4 L^s	26×½ Pl.	[illegible]
I.	4-6×6×3/4 L^s	30×3/8 Pl.	[illegible]
I1.	4-6×6×3/4 L^s	30×3/8 Pl.	[illegible]
I2.	4-6×6×3/4 L^s	30×3/8 Pl.	[illegible]
J.	4-6×6×7/8 L^s	30×3/8 Pl.	[illegible]
K.	4-6×6×11/16 L^s	26×½ Pl.	[illegible]
L.	4-6×6×5/8 L^s	26×7/16 Pl.	[illegible]
M.	4-6×4×3/4 L^s	30×7/16 Pl. 2-[illegible]	[illegible]
N.	4-6×6×7/8 L^s	33×7/16 Pl.	204
O.	4-5×3½×5/16 L^s	24×3/8 Pl.	125
P.	4-5×3½×½ L^s	24×3/8 Pl.	60
Q.	4-5×3½×9/16 L^s	24×3/8 Pl. Reinforced	[illegible]
R.	4-5×3½×5/8 L^s	33×3/8 Pl.	86

NOTES

Rivets in Girders and Girder Connections are 7/8" dia
All other Rivets are 3/4" dia unless otherwise noted
Standard Bulb Angle Columns { 4-4×3×3/8" Bulb Angles. 1-6×1/4" Web Plate.
Special " " " "A" { 4-4×3×3/8" Bulb Angles 1-6×3/8" Web Plate 2-8×3/8" Cover "
I Beam Columns = 12" I^s-40# except under Girder "M"
All Beams under El R'y Columns spaced 12" c'ts unless otherwise shown.
Sidewalls to have 1¼" Vertical Sq Rods 10" c'ts except at Stairways and where otherwise shown
Roof Rods are 1¼" Sq, 7½" c'ts except where otherwise shown
Bents spaced 5'-0" c. to c. unless otherwise noted
Roof Load = 1400# per sq Ft
Unit Stresses { Girders & Beams { Tension = 20000 lbs per sq in
Compression = do do
Shear = 10000 do
Rivets { Shear = 12500 do
Bearing = 25000 do
Field Rivets 25% less than the above.

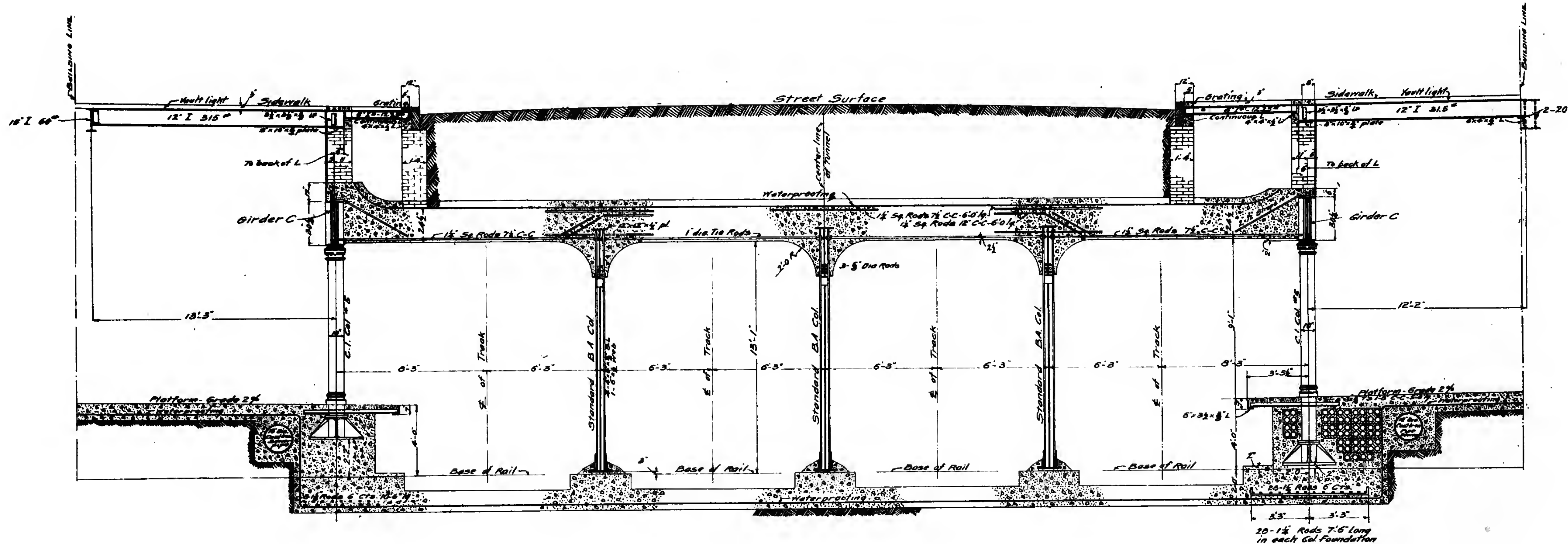


GIRDER SCHEDULE			
MARK	FLANGES.	WEB.	REACTIONS
A.	4-6"x4"x1/2" L^s	30"x3/8" Pl	65 700
B.	4-6"x6"x7/8" L^s	30"x3/4" Pl	158 900 139 700
B1	4-6"x6"x7/8" L^s	30"x3/4" Pl	173 100 164 400
C.	4-6"x4"x1/2" L^s	30"x9/16" Pl	98 600
D.	4-6"x6"x5/8" L^s	30"x11/16" Pl	125 400 123 300
D1 D2	4-6"x6"x5/8" L^s	30"x11/16" Pl.	-133 100 -130400 & 66900
E.	4-6"x6"x13/16" L^s	26"x11/16" Pl.	158 700 116 900
F.	4-6"x6"x1/2" L^s	26"x9/16" Pl.	116 300 84 800
F1.	4-6"x6"x1/2" L^s	26"x9/16" Pl.	137 700 85 100
G.	4-6"x6"x5/8" L^s	26"x1/2" Pl	124 100 95 700
G1	4-6"x6"x5/8" L^s	26"x1/2" Pl.	113 300 90 700
H	4-6"x6"x3/4" L^s	26"x1/2" Pl	148 500 112 800
H1.	4-6"x6"x3/4" L^s	26"x1/2" Pl.	137 800 104 600
I.	4-6"x6"x3/4" L^s	30"x1/2" Pl	141 700 132 400
I1.	4-6"x6"x3/4" L^s	30"x1/2" Pl	130 000 126 400
I2.	4-6"x6"x3/4" L^s	30"x1/2" Pl.	163 500 40 800
J.	4-6"x6"x7/8" L^s	30"x1/2" Pl.	170 600 145 700
K	4-6"x6"x11/16" L^s	26"x3/4" Pl	187 000 85 000
L.	4-6"x6"x5/8" L^s	26"x11/16" Pl.	163 300 80 600
M	4-6"x4"x3/4" L^s	30"x3/8" Pl. 2-[illegible]	100 000 65 000
N.	4-6"x6"x7/8" L^s	33"x13/16" Pl	204 700
O.	4-5"x3 1/2"x5/8" L^s	24"x1/2" Pl	125 000
P	4-5"x3 1/2"x1/2" L^s	24"x1/2" Pl	50 000
Q.	4-5"x3 1/2"x5/8" L^s	24"x1/2" Pl REINFORCED	125 000 45 000
R.	4-5"x3 1/2"x5/8" L^s	33"x9/16" Pl.	86 000

PLAN OF

HOYT STREET STATION

APPROVED: George S. Rice
CHIEF ENGINEER

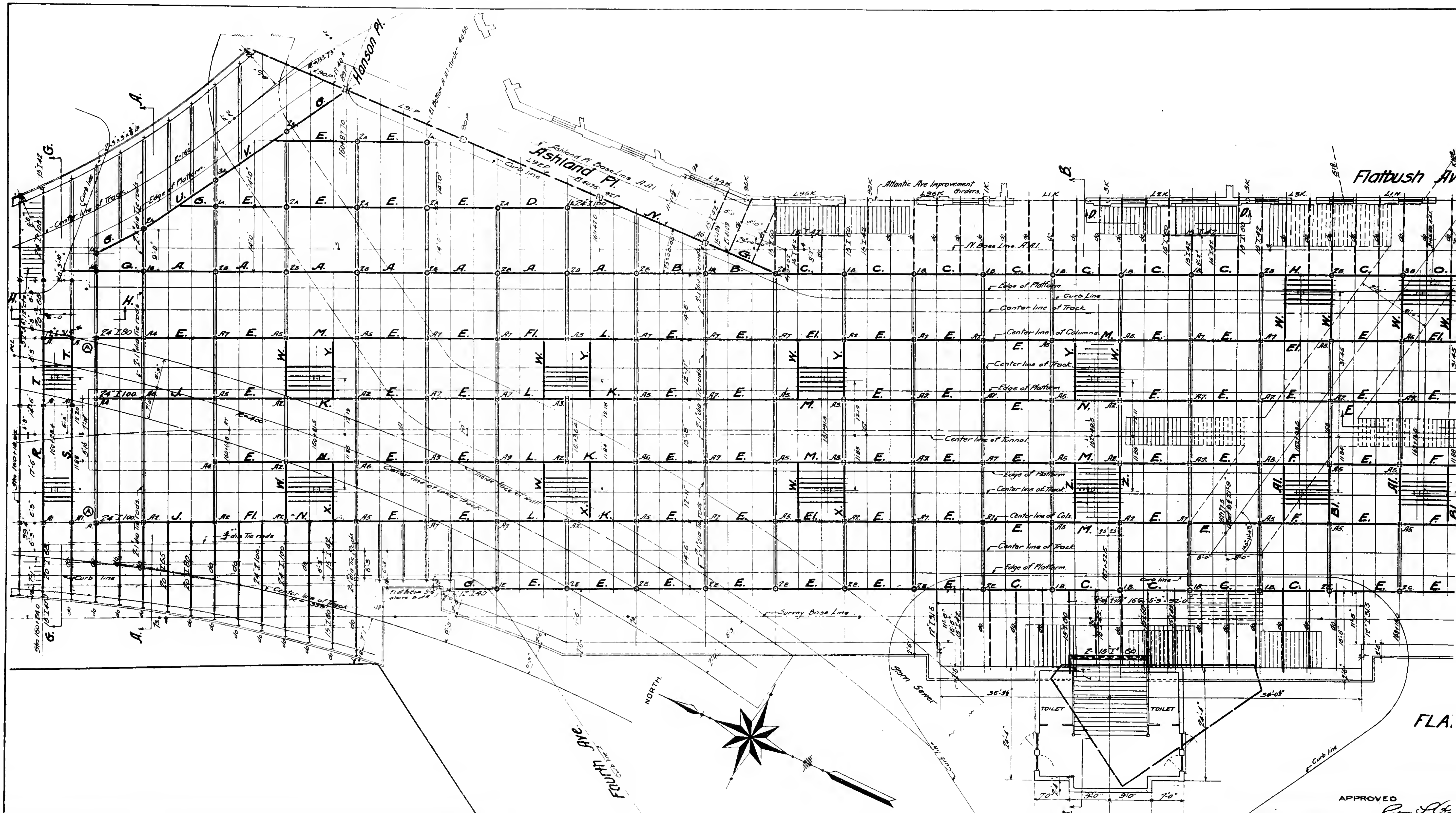


SECTION A-A

APPROVED George S. Rice CHIEF ENGINEER

SECTION AT

HOYT STREET STATION

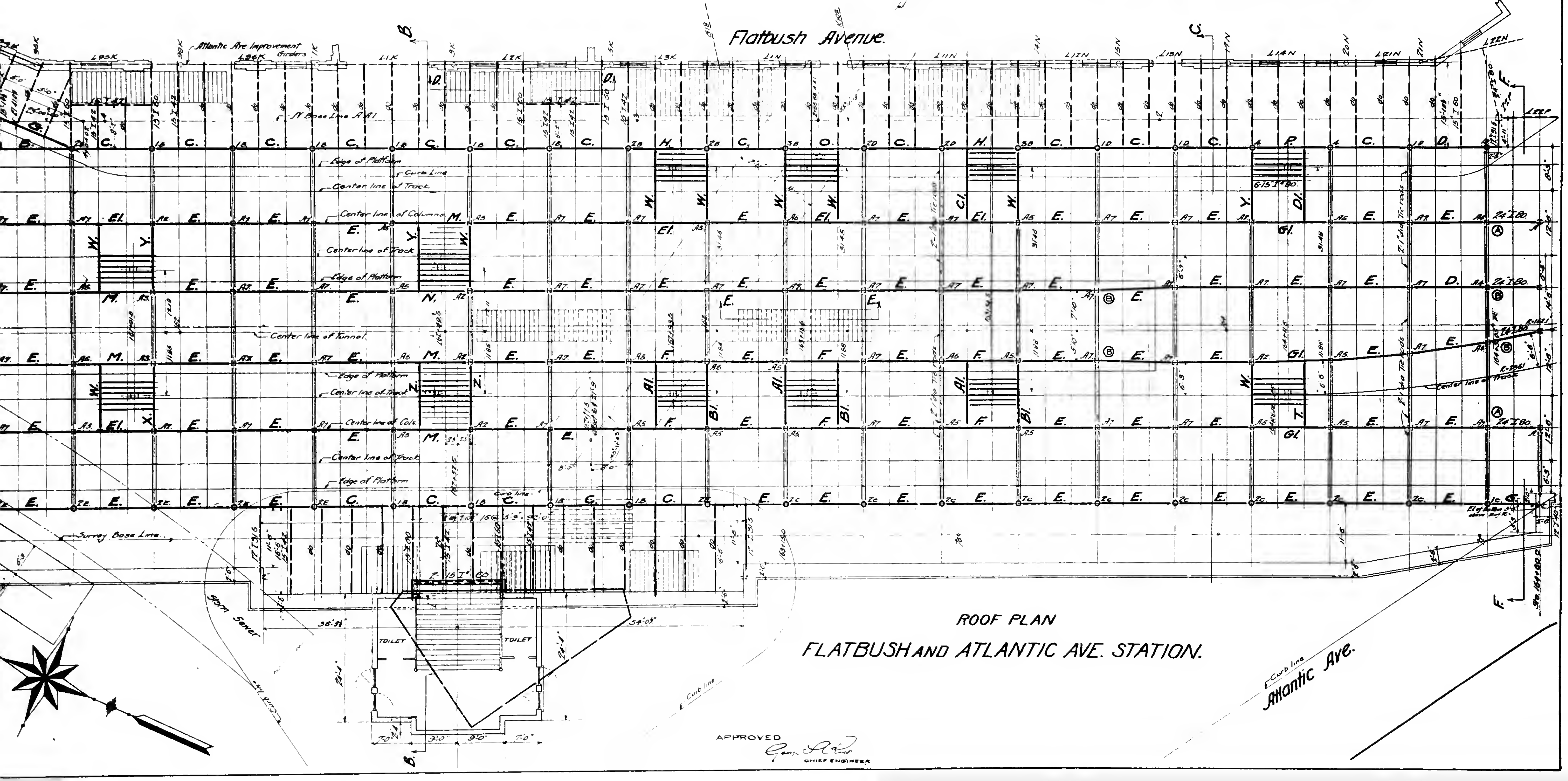

Hanson Pl.
Ashland Pl.
Ashland Pl. Base Line A.A.I.
Curb line
Atlantic Ave Improvement Girders.
N. Base Line A.A.I.
Flatbush Av
Center line of Track
Edge of Platform
Curb Line
Center line of Columns
Center line of Tunnel
Center line of Lower Track
Inside face of Wall
Center line of Cols.
Survey Base Line
Storm Sewer
Fourth Ave.
NORTH
TOILET
TOILET
Curb line
FLA
APPROVED
CHIEF EN

GENERAL NOTES

Standard details to be used where not otherwise shown or indicated.
Elevation of bottom of Cast Iron columns 1'-8" above Base of Rail.
do. do do do Bulb angle do 4" below do do.
Cast Iron Columns faced top and bottom.
Bulb angle do do as noted.
All girder stiffeners ground to bear top and bottom.
All rivets in girders & girder connections 7/8" dia. All other rivets 3/4" dia. unless otherwise noted.
Bents spaced 5'-0" center to center, unless otherwise noted, and normal to center line of Tunnel.

Unit Stresses
- Girders and Beams
  - Tension. 20.000 lbs. per sq. in.
  - Compression. 20.000 do.
  - Shear 10.000 do
- Rivets
  - Shear 12.500 do.
  - Bearing 26.000 do

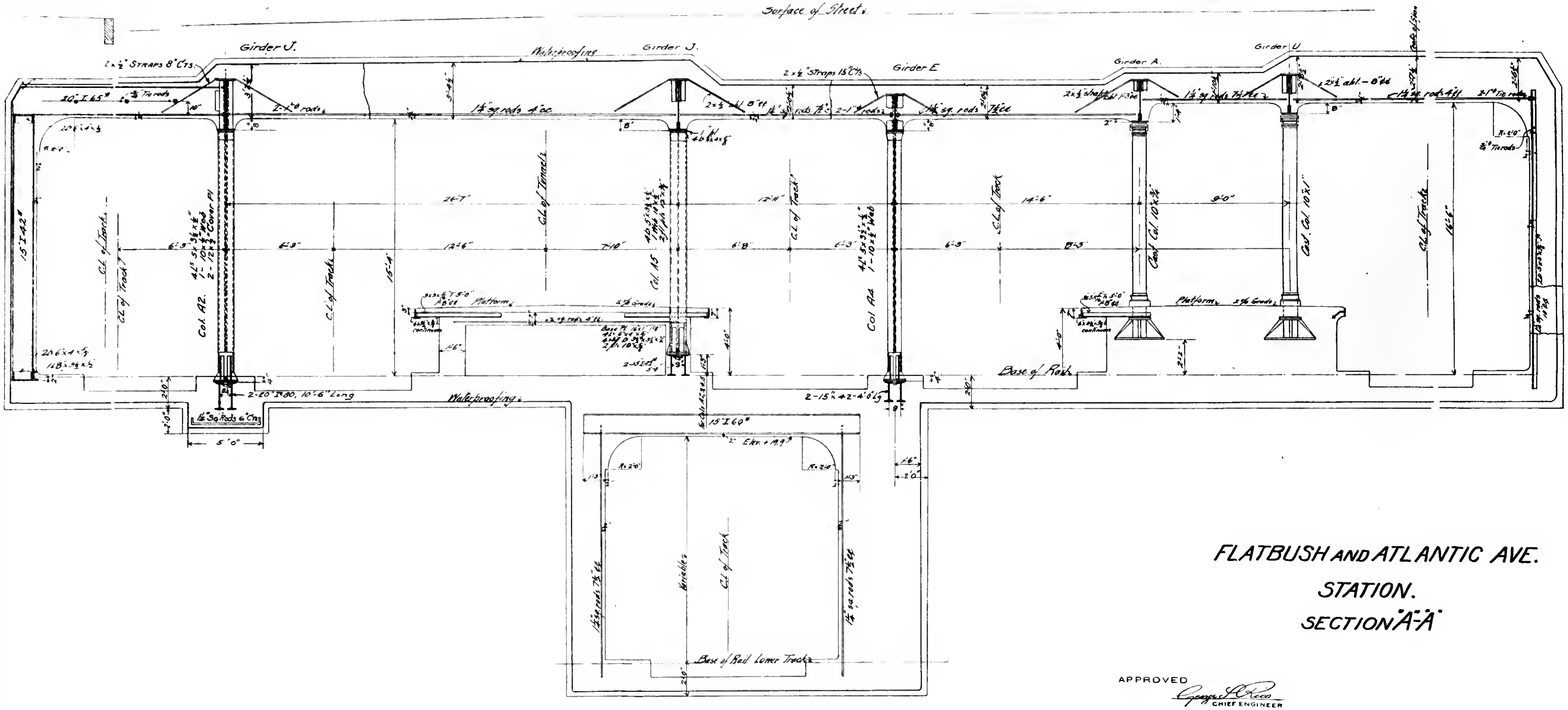
Field rivets 25% less than above.
Clearance from Base of Rail 15'-4" between Sta. 160+30.0 and 163+16.0, & 13'-1" otherwise, except N of Girders "A" which is 16'-6".
Grillage beams under El. Ry. columns 15" I 60, unless noted.
Roof load 1300 lbs. per square foot. Vault lights 500 lbs. per sq. ft.
18" and 20" sidewalls to have 1¼" sq. rods, 10" c.-c., except between I Cols.
Elevation of bottom of angle Columns as noted on Sections "B-B" and "C-C".



ROOF PLAN

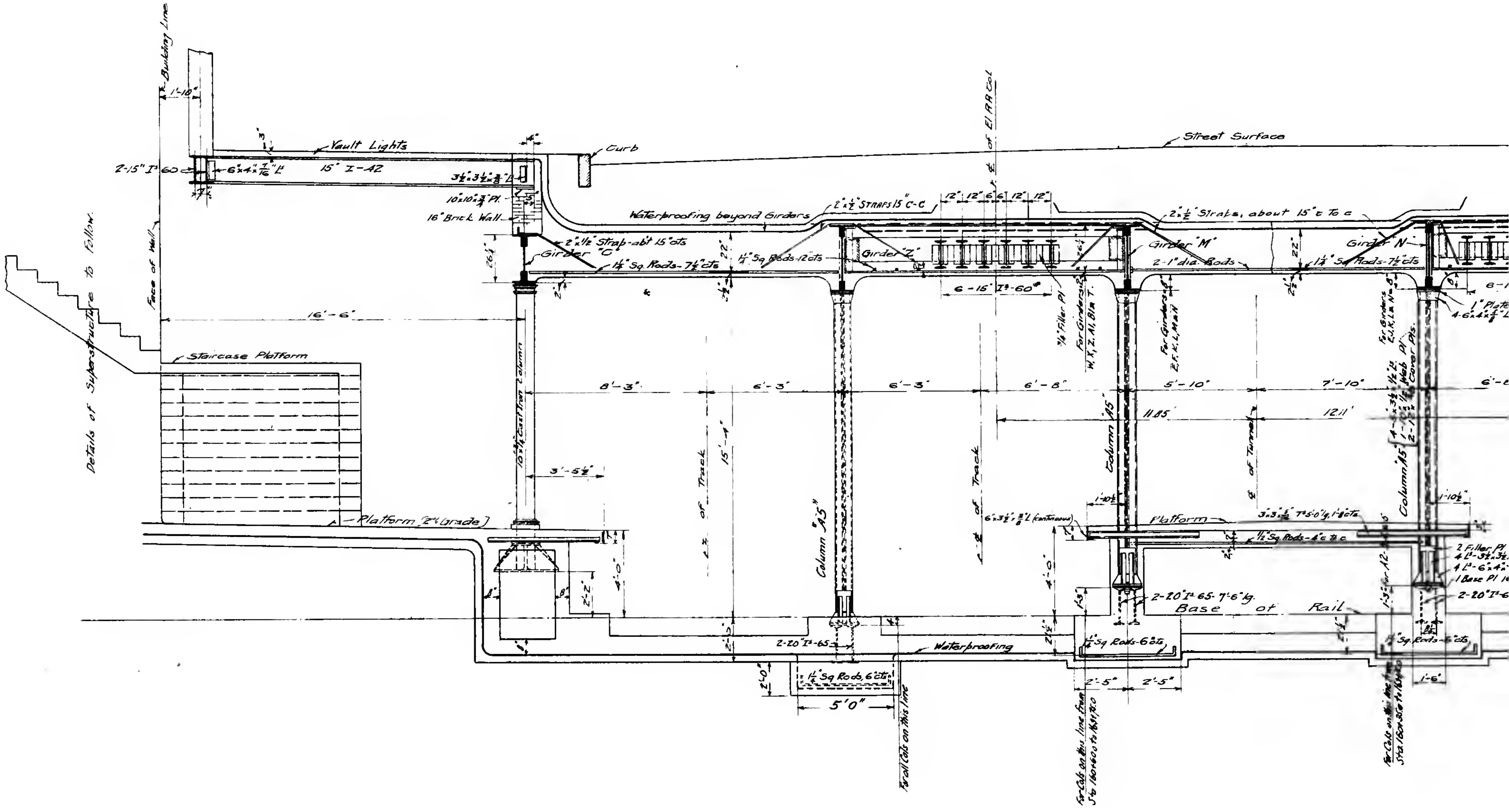
FLATBUSH AND ATLANTIC AVE. STATION.

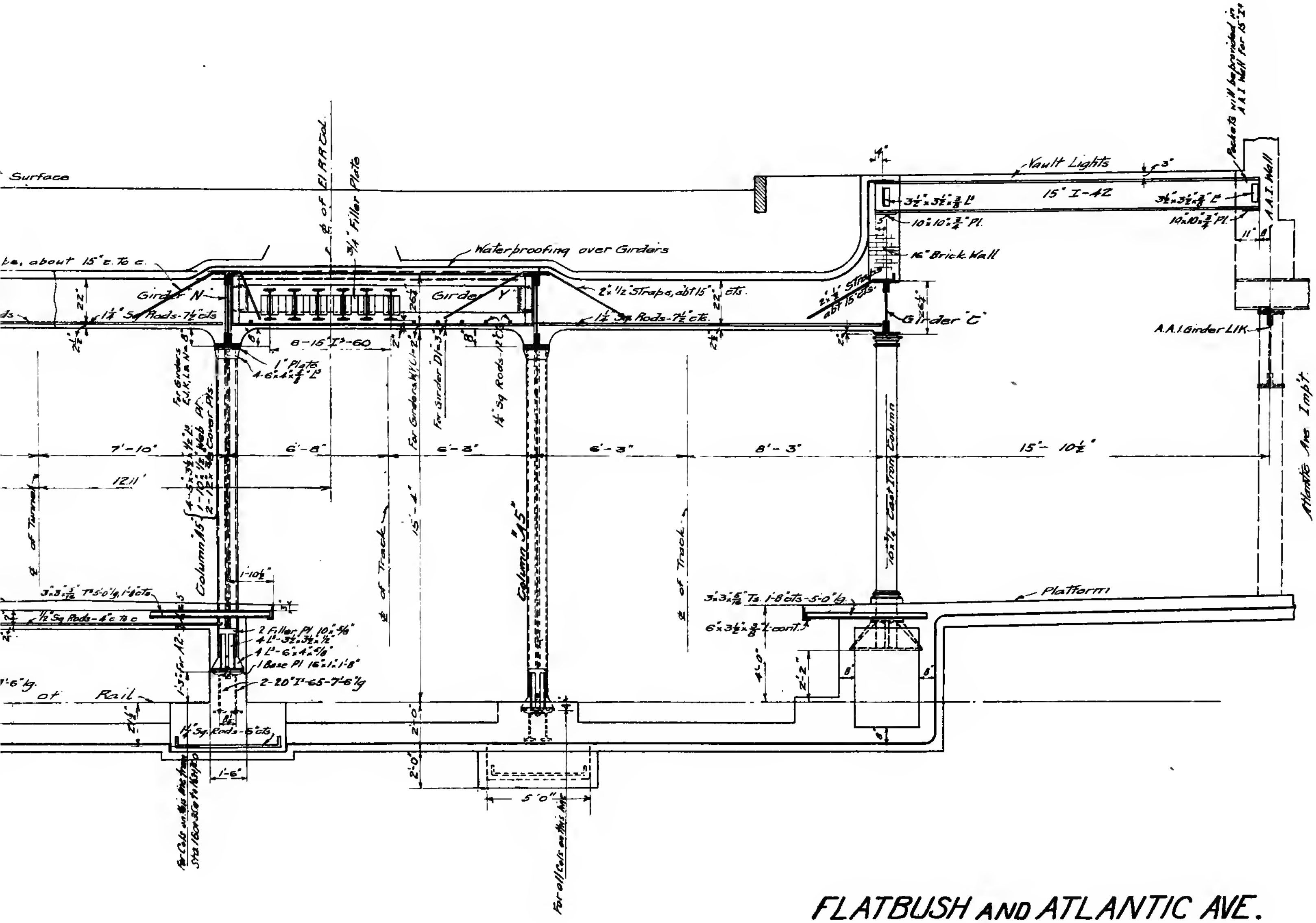
APPROVED
Geo. S. Rice
CHIEF ENGINEER



FLATBUSH AND ATLANTIC AVE.
STATION.
SECTION "A-A"

APPROVED George S. Rice
CHIEF ENGINEER

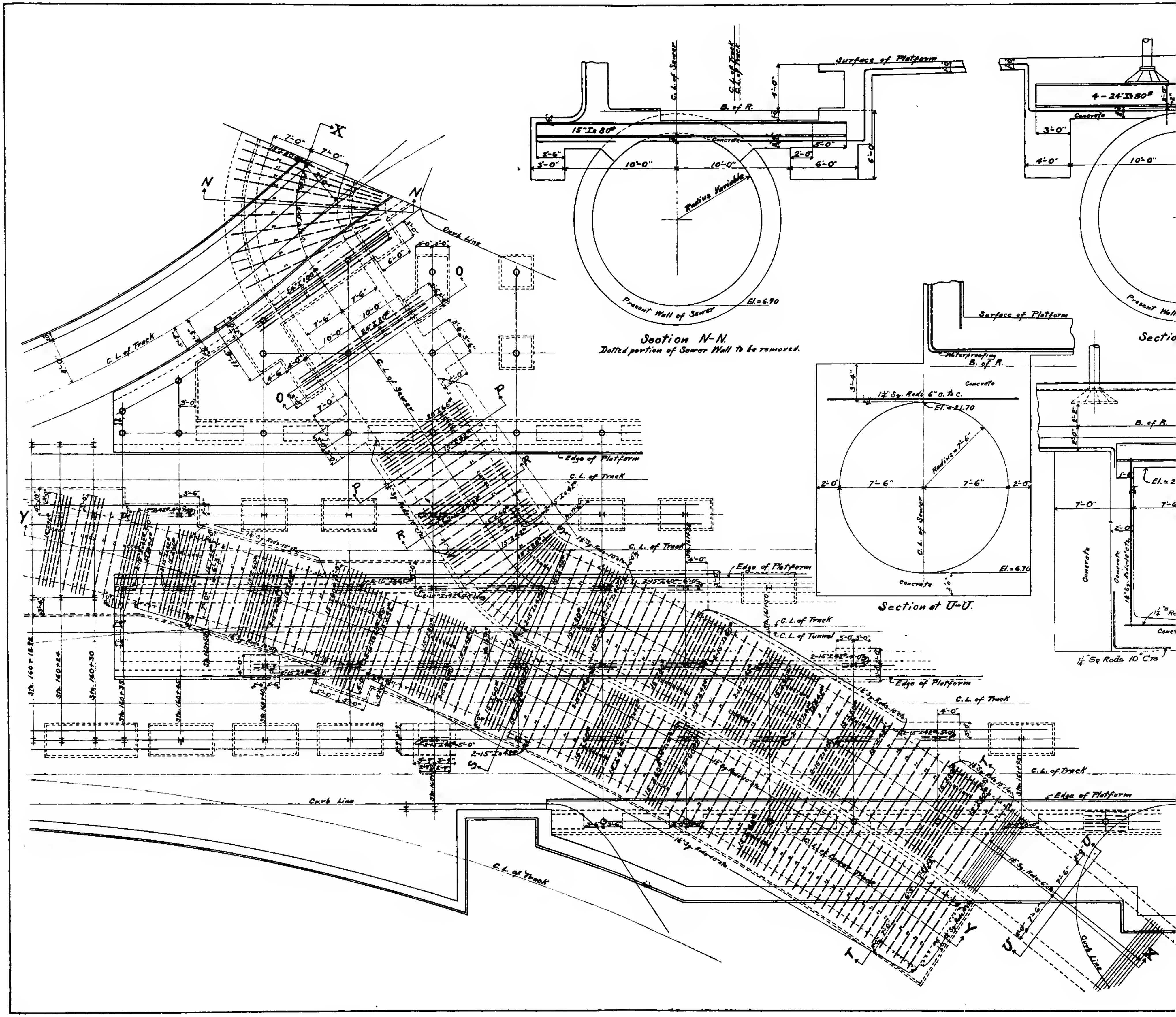

Details of Superstructure to Follow.
Building Line
1'-10"
Face of Wall
Vault Lights
3"
2-15" I^s 60
6"x4"x7/16" L^s
15" I-42
3½"x3½"x3/8" L
4"
Curb
10"x10"x3/4" Pl.
16" Brick Wall
Street Surface
Waterproofing beyond Girders
2"x½" Straps 15" C-C
12" 12" 6 6 12" 12"
℄ of El RR Col
2"x½" Straps, about 15" c to c
2"x½" Strap-abt 15" cts
Girder "C"
1¼" Sq Rods-7½" cts
1¼" Sq Rods-12 cts
Girder "Z"
6-15" I^s-60#
3/4 Filler Pl
For Girders W, X, Z, A1, B1 & T.
Girder "M"
2-1" dia Rods
For Girders E, F, K, L, M & N
22"
1¼" Sq Rods-7½" cts
Girder "N"
For Girders E, J, K, L & N=8
1" Plate
4-6"x4"x⅝" L
26½"
22"
16'-6"
Staircase Platform
10"x1¼" Cast Iron Column
8'-3"
6'-3"
6'-3"
6'-8"
5'-10"
7'-10"
6'-
11.85'
12.11'
℄ of Track
15'-4"
℄ of Track
℄ of Tunnel
Column "A5"
Column "A5"
Column "A5"
4-3½x3½x½ L^s
1-10½x½ Web Pl
2-1/2x¾ Cover Pls.
3'-5½"
1'-10½"
1'-10½"
6"x3½"x3/8" L (continuous)
Platform
3"x3"x5/16" T^s 5'-0" lg, 1'-8" cts
1½" Sq Rods-4" c to c
Platform (2% Grade)
2 Filler Pl
4 L^s-3½x3½
4 L^s-6"x4"
1 Base Pl
2-20" I^s-6
4'-0"
4'-0"
2'-2"
8"
8"
2-20" I^s 65-7'-6" lg.
Base of Rail
1'-3" for A2
2-20" I^s-65
Waterproofing
2'-0"
1¼" Sq Rods, 6" cts
1¼" Sq Rods-6" cts
1¼" Sq Rods-6" cts
5'0"
2'-5"
2'-5"
1'-6"
For all Cols on this line
For Cols on this line from Sta 160+600 to 169+70
For Cols on this line from Sta 160+30 to 163+70



Surface
℄ of El. R.R. Col.
3/4" Filler Plate
Waterproofing over Girders
about 15" c. to c.
Girder N
Girder Y
22"
1 1/4" Sq. Rods-7 1/2" cts.
2" x 1/2" Straps, abt 15" cts.
1 1/2" Sq. Rods-7 1/2" cts.
2 1/2"
26 1/2"
6-15" I^s-60
1" Plate
4-6" x 4" x 5/8" L^s
For Girders E.J.K.L.&N. = 8"
For Girders W.Y.C.I. = 2"
For Girder D.I. = 3"
1 1/4" Sq. Rods 12" cts.
8"
7'-10"
6'-8"
6'-3"
6'-3"
8'-3"
15'-10 1/2"
12.11'
℄ of Tunnel
Column "A5" 4-5" x 3 1/2" x 1/2" L^s, 1-10" x 1/2" Web Pl., 2-12" x 3/8" Cover Pls.
℄ of Track
15'-4"
Column "A5"
℄ of Track
10" x 3/4" Cast Iron Column
1'-10 1/2"
3" x 3" x 5/16" T^s 5'-0" lg, 1'-8" cts.
1/2" Sq. Rods-4" c to c
2 Filler Pl 10" x 5/8"
4 L^s-3 1/2" x 3 1/2" x 1/2"
4 L^s-6" x 4" x 5/8"
1 Base Pl 16" x 1" x 1'-8"
2-20" I^s-65-7'-6" lg
1'-3" for A2-
1'-6" lg.
of Rail
1 1/4" Sq. Rods-6" cts.
2'-0"
2'-0"
1'-6"
5'-0"
For Cols on this line from Sta. 160+35 to 163+20
For all Cols on this line
3" x 3" x 5/16" Ts. 1'-8" cts-5'-0" lg.
6" x 3 1/2" x 3/8" L cont.
4'-0"
2'-2"
8"
8"
6"
Platform
Vault Lights
3"
4"
15" I-42
3 1/2" x 3 1/2" x 3/8" L^s
10" x 10" x 3/4" Pl.
3 1/2" x 3 1/2" x 3/8" L^s
10" x 10" x 3/4" Pl.
16" Brick Wall
2" x 1/2" Straps abt 15" cts.
Girder "C"
26 1/2"
A.A.I. Wall
Pockets will be provided in A.A.I. Wall for 15" I^s
11"
8"
A.A.I. Girder L1K
Atlantic Ave Imp't.

FLATBUSH AND ATLANTIC AVE.
STATION.
SECTION "B"-"B"

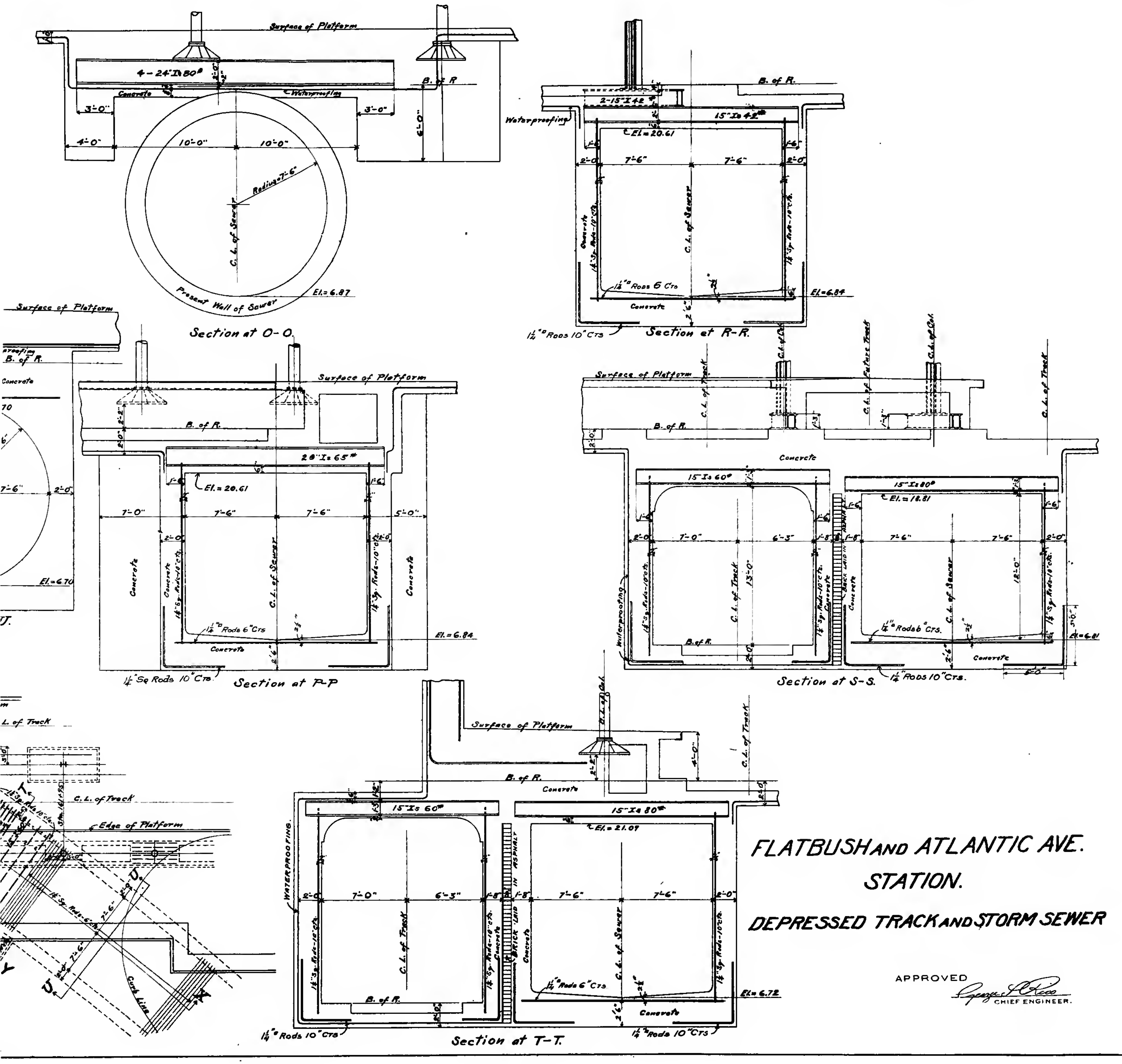
APPROVED
George S. Rice
CHIEF ENGINEER.



Section N-N.

Dotted portion of Sewer Wall to be removed.

Section at U-U.



FLATBUSH AND ATLANTIC AVE. STATION.

DEPRESSED TRACK AND STORM SEWER

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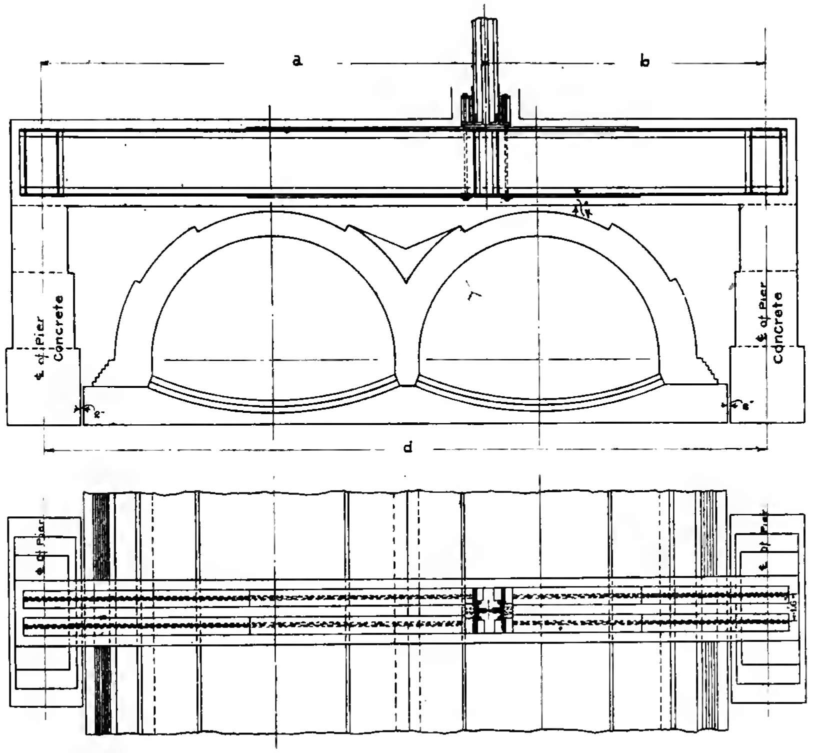
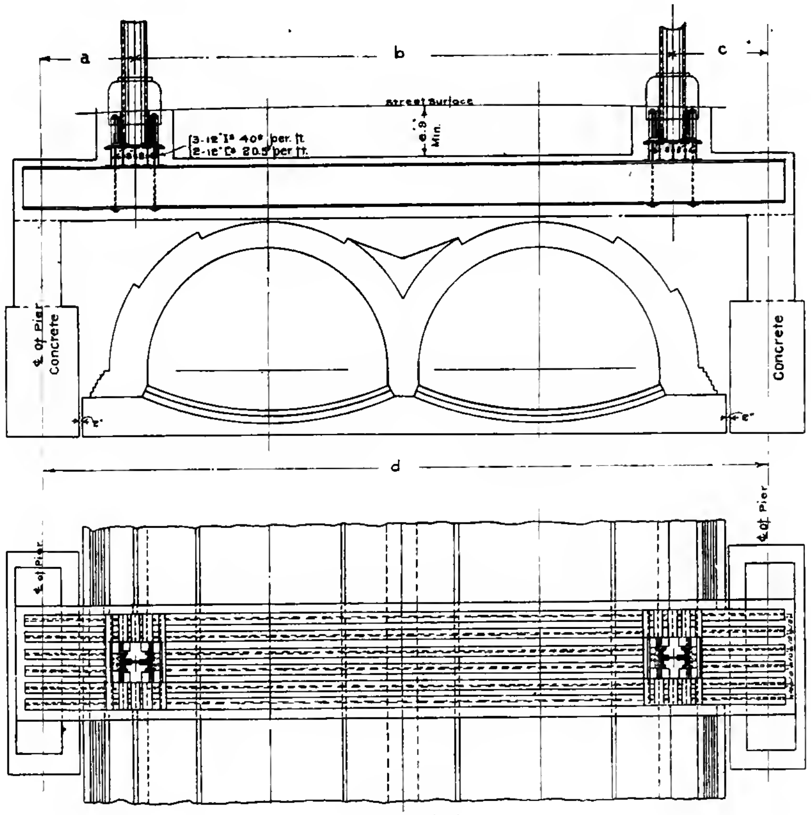
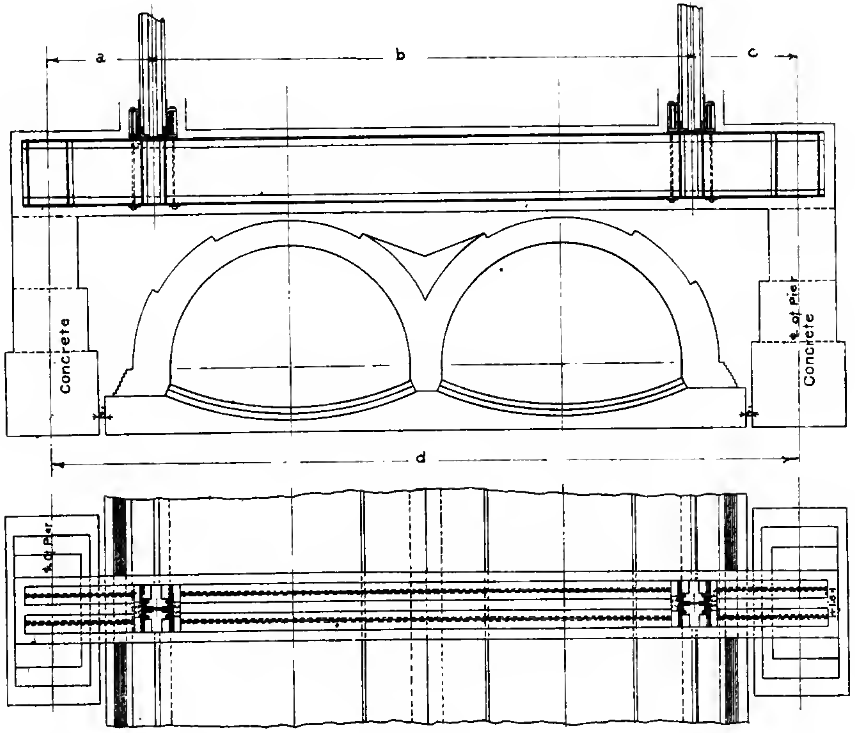
CHIEF ENGINEER.



TYPE "A"



TYPE "C"



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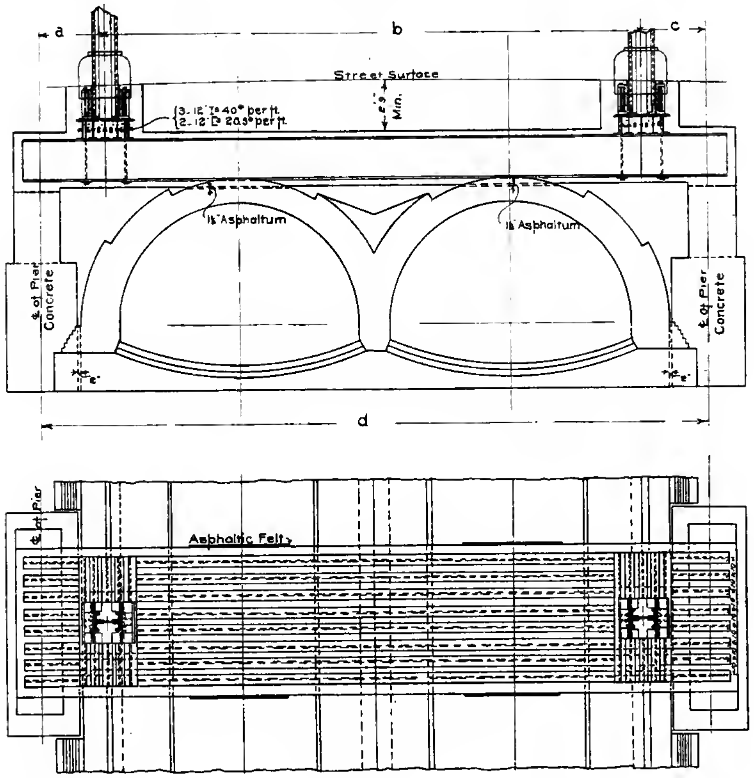
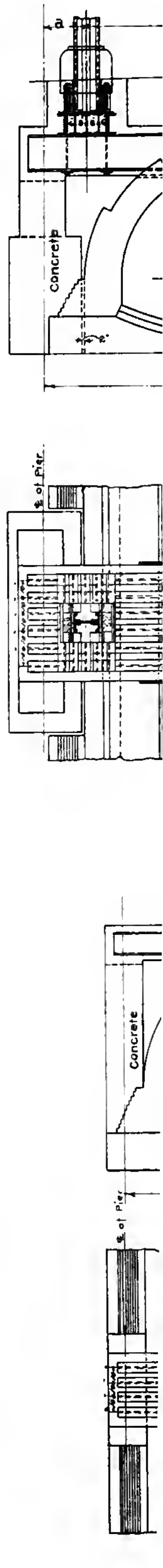
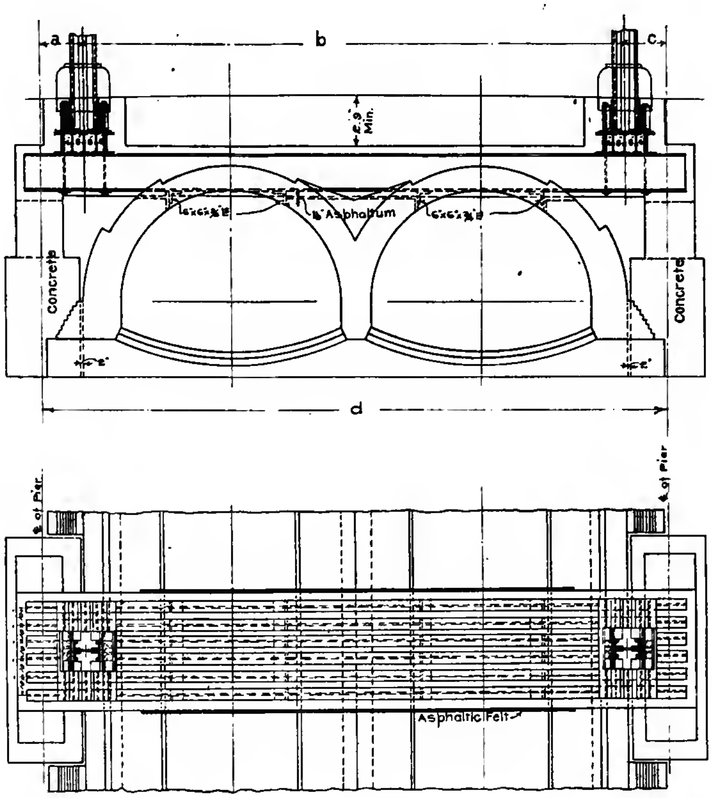
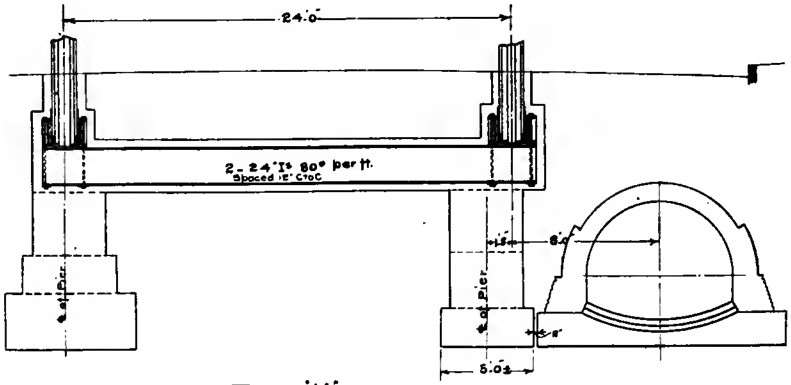


TYPE "D"

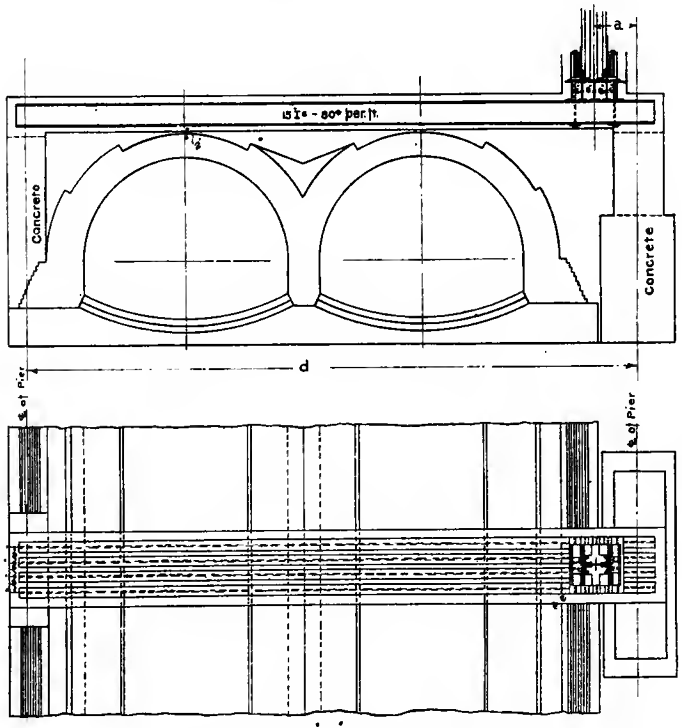




TYPE "E"



TYPE "K"



TYPE "F".

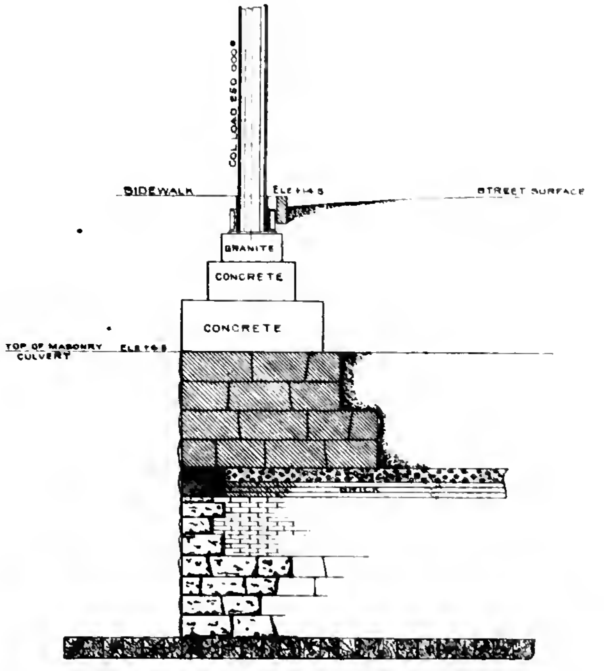
NOTE:- Where Two Beams Are Used Spacing To Be 1'-0" C to C

Type "H" is similar but grillage cuts into sewer structure

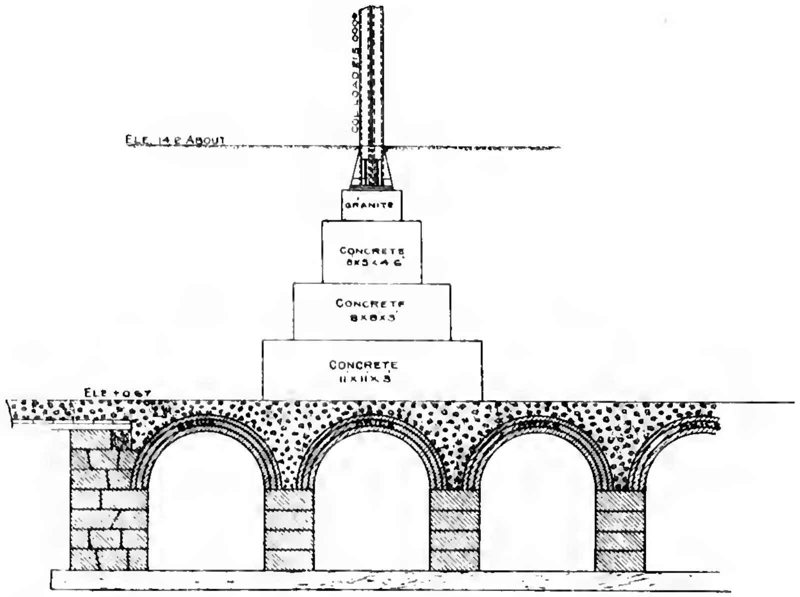
VAN CORTLAND PARK EXTENSION.

GRILLAGE FOUNDATIONS FOR COLUMNS OVER BROADWAY SEWER.

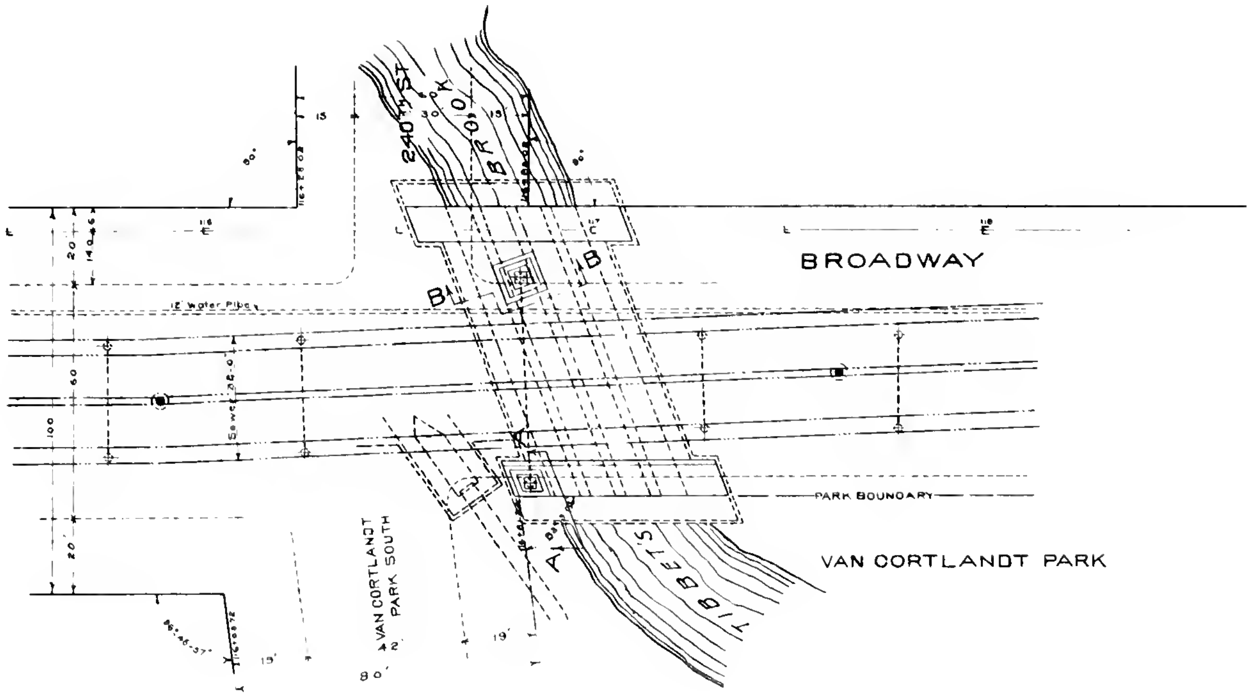
APPROVED George S. Rice
CHIEF ENGINEER



SECTION A-A

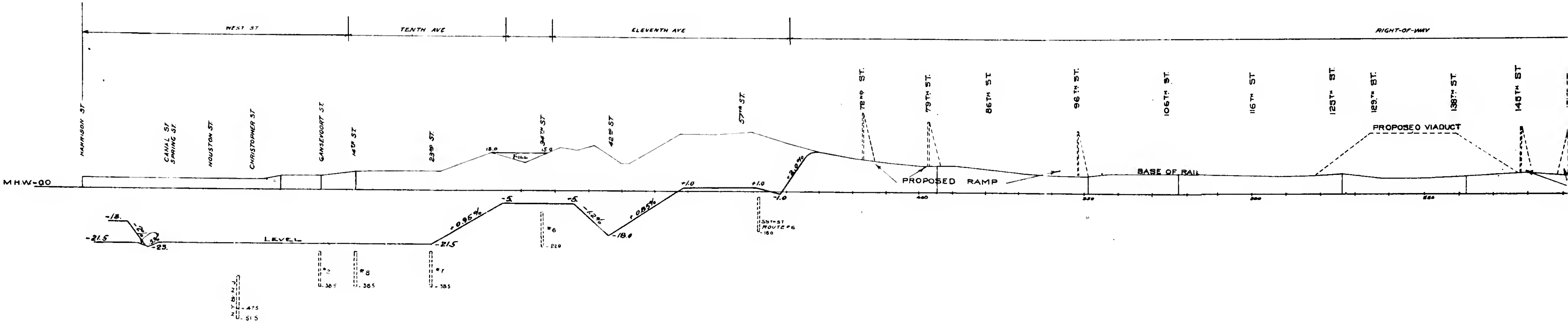


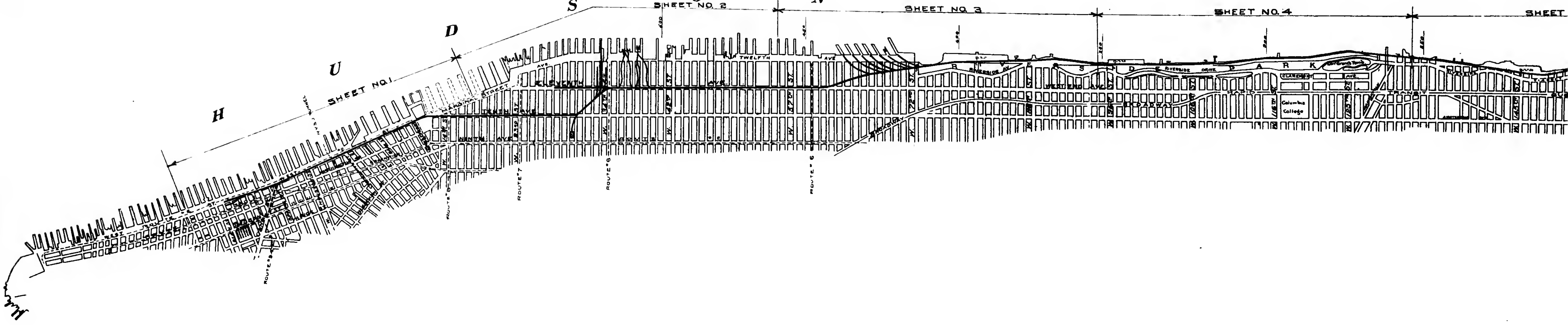
SECTION B-B

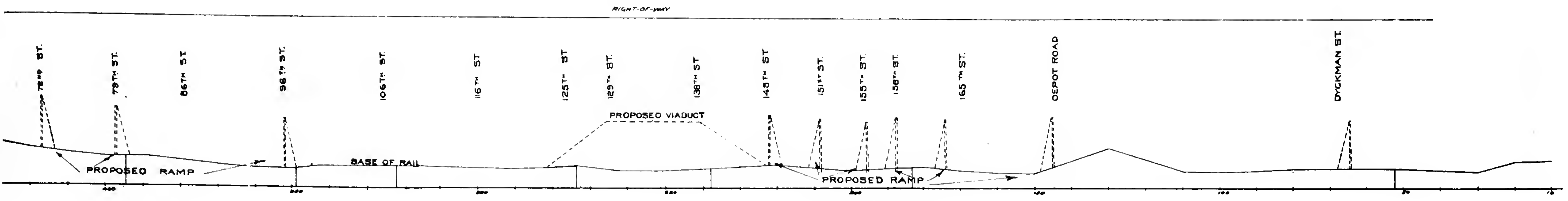


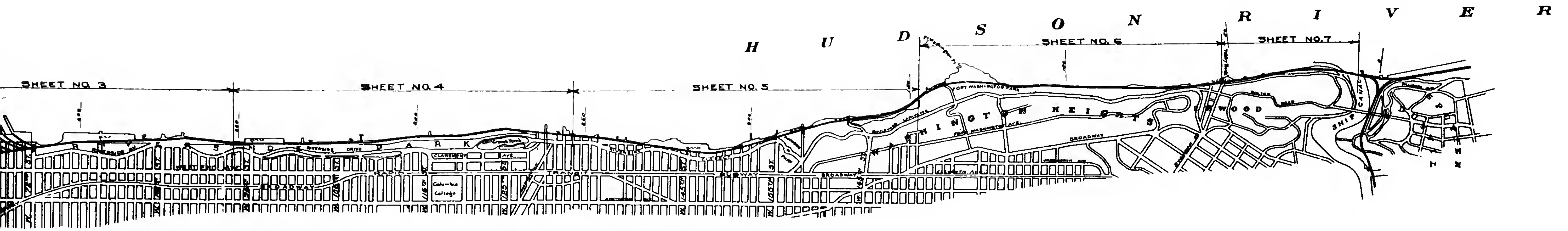
COLUMN FOUNDATION OVER TIBBET'S BROOK 240TH ST. AND BROADWAY.

APPROVED George S. Rice
CHIEF ENGINEER


WEST ST
TENTH AVE
ELEVENTH AVE
RIGHT-OF-WAY
HARRISON ST
CANAL ST
SPRING ST
HOUSTON ST
CHRISTOPHER ST
GANSEVOORT ST
14TH ST
23RD ST
34TH ST
42ND ST
57TH ST
72ND ST
79TH ST
86TH ST
96TH ST
106TH ST
116TH ST
125TH ST
129TH ST
138TH ST
145TH ST
PROPOSED VIADUCT
PROPOSED RAMP
BASE OF RAIL
FILL
18.0
15.0
MHW-00
-18.
-21.5
-25.
LEVEL
-21.5
+0.95%
-5
-5
-1.2%
-18.0
+0.85%
+1.0
+1.0
-1.0
+2.0%
N.Y. & N.J.
-47.5
-51.5
#2
-38.5
#8
-38.5
#1
-38.5
#6
-22.0
55TH ST
ROUTE #6
-16.0


H
U
D
S
O
N
SHEET NO. 1
SHEET NO. 2
SHEET NO. 3
SHEET NO. 4
SHEET
MARGINAL STREET
ELEVENTH AVE
TENTH AVE
NINTH AVE
TWELFTH AVE
RIVERSIDE DRIVE
RIVERSIDE PARK
WEST END AVE
BROADWAY
CLAREMONT AVE
RAPID TRANSIT
Columbia College
ROUTE #6
ROUTE #7
ROUTE #8
ROUTE #6
ROUTE #5





BOARD OF

RAPID TRANSIT RAILROAD COMMISSIONERS

OF THE CITY OF NEW YORK

PLAN TO RECONSTRUCT THE N.Y.C.&H.R.R.

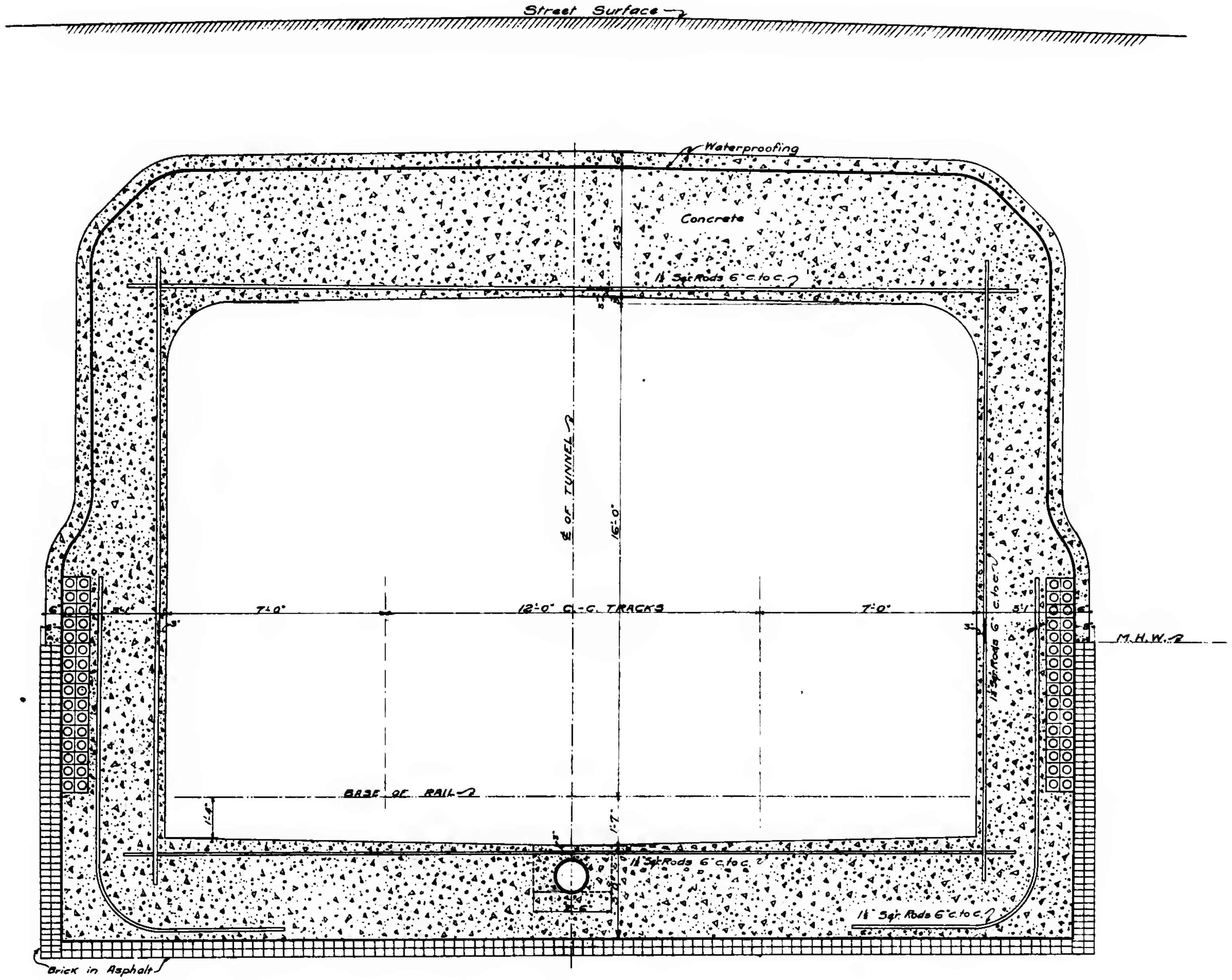
TO TERMINATE THE USE OF STREETS, AVENUES AND PUBLIC PLACES

IN THE BOROUGH OF MANHATTAN.

ROUTES AND GENERAL PLAN

KEY MAP ALTERNATIVE PLAN NO. 1

APPROVED
George S. Rice
CHIEF ENGINEER



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BOARD OF
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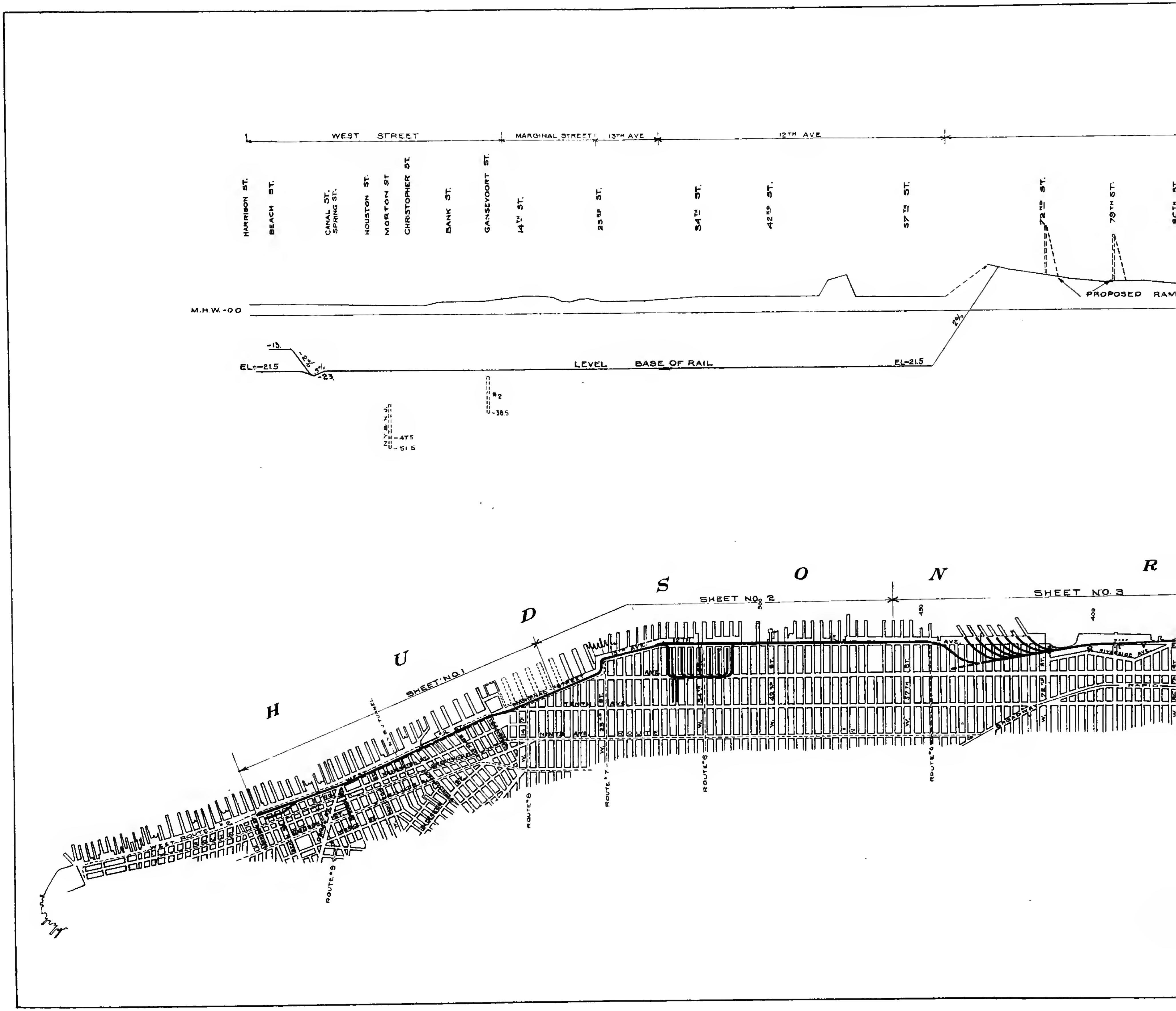
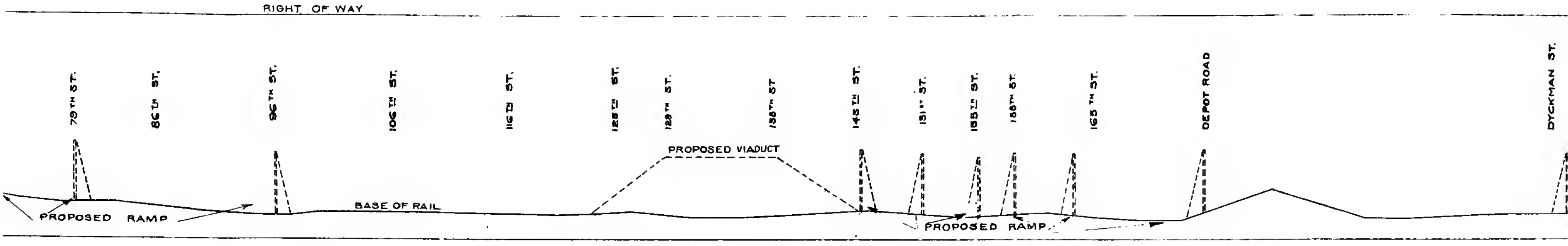
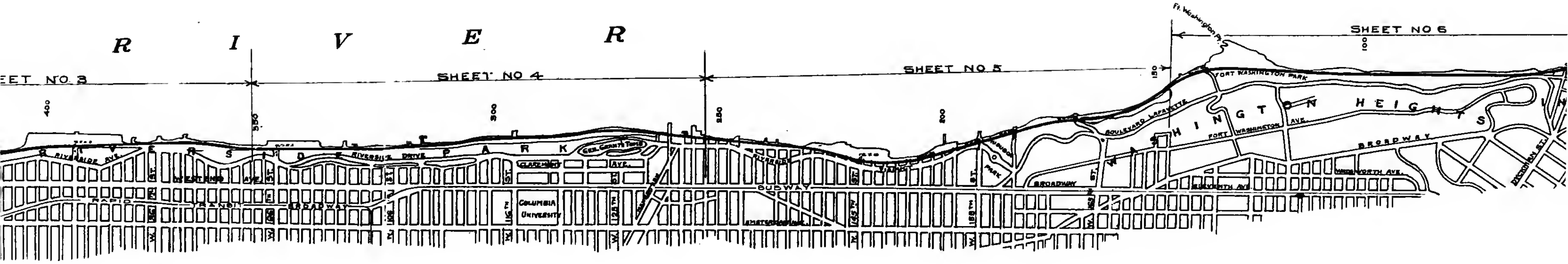
OF THE CITY OF NEW YORK
PLAN TO RECONSTRUCT THE N.Y.C.&H.R.R.
TO TERMINATE THE USE OF STREETS, AVENUES AND PUBLIC PLACES
IN THE BOROUGH OF MANHATTAN.
TYPICAL CROSS SECTION
ALTERNATIVE PLAN NO. 1


WEST STREET
MARGINAL STREET
13TH AVE
12TH AVE
HARRISON ST.
BEACH ST.
CANAL ST.
SPRING ST.
HOUSTON ST.
MORTON ST.
CHRISTOPHER ST.
BANK ST.
GANSEVOORT ST.
14TH ST.
23RD ST.
34TH ST.
42ND ST.
57TH ST.
72ND ST.
79TH ST.
PROPOSED RAM
M.H.W.-00
-13.
EL=-21.5
-23.
LEVEL
BASE OF RAIL
EL-21.5
2%
-38.5
-47.5
-51.5
H
U
D
S
O
N
R
SHEET NO.1
SHEET NO. 2
SHEET NO. 3
WEST ROUTE
TENTH AVE.
NINTH AVE.
RIVERSIDE AVE.
BROADWAY
RAPID
ROUTE 6
ROUTE 7
ROUTE 8
ROUTE 9
TUNNEL





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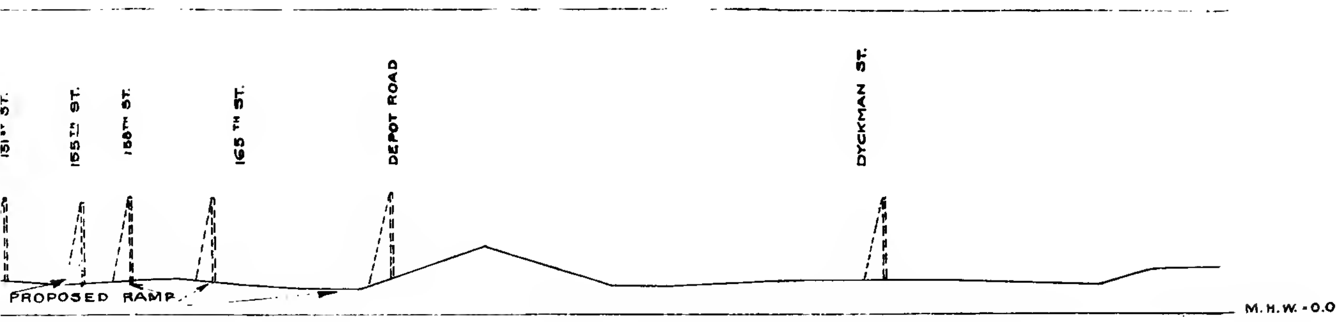
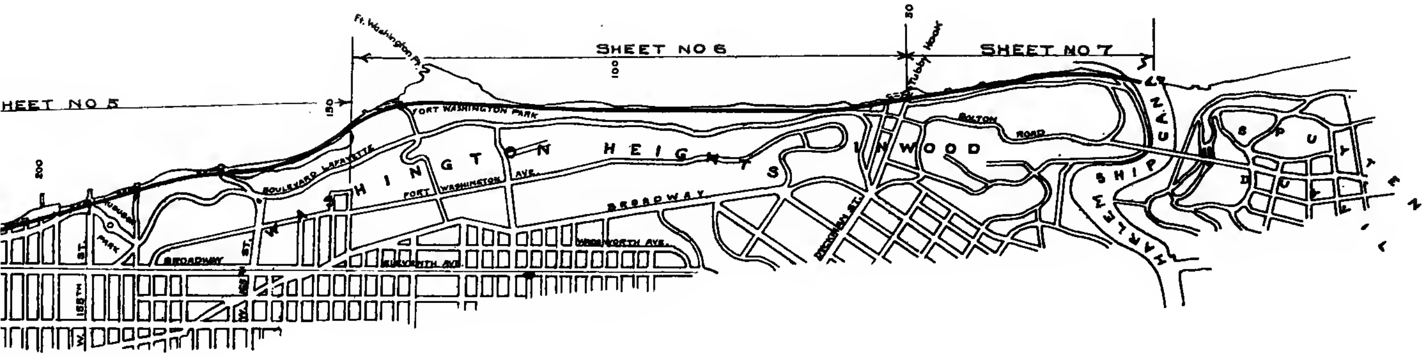
CHIEF ENGINEER.





BOARD OF

RAPID TRANSIT RAILROAD COMMISSIONERS

OF THE CITY OF NEW YORK

PLAN TO RECONSTRUCT THE N.Y.C.&H.R.R.

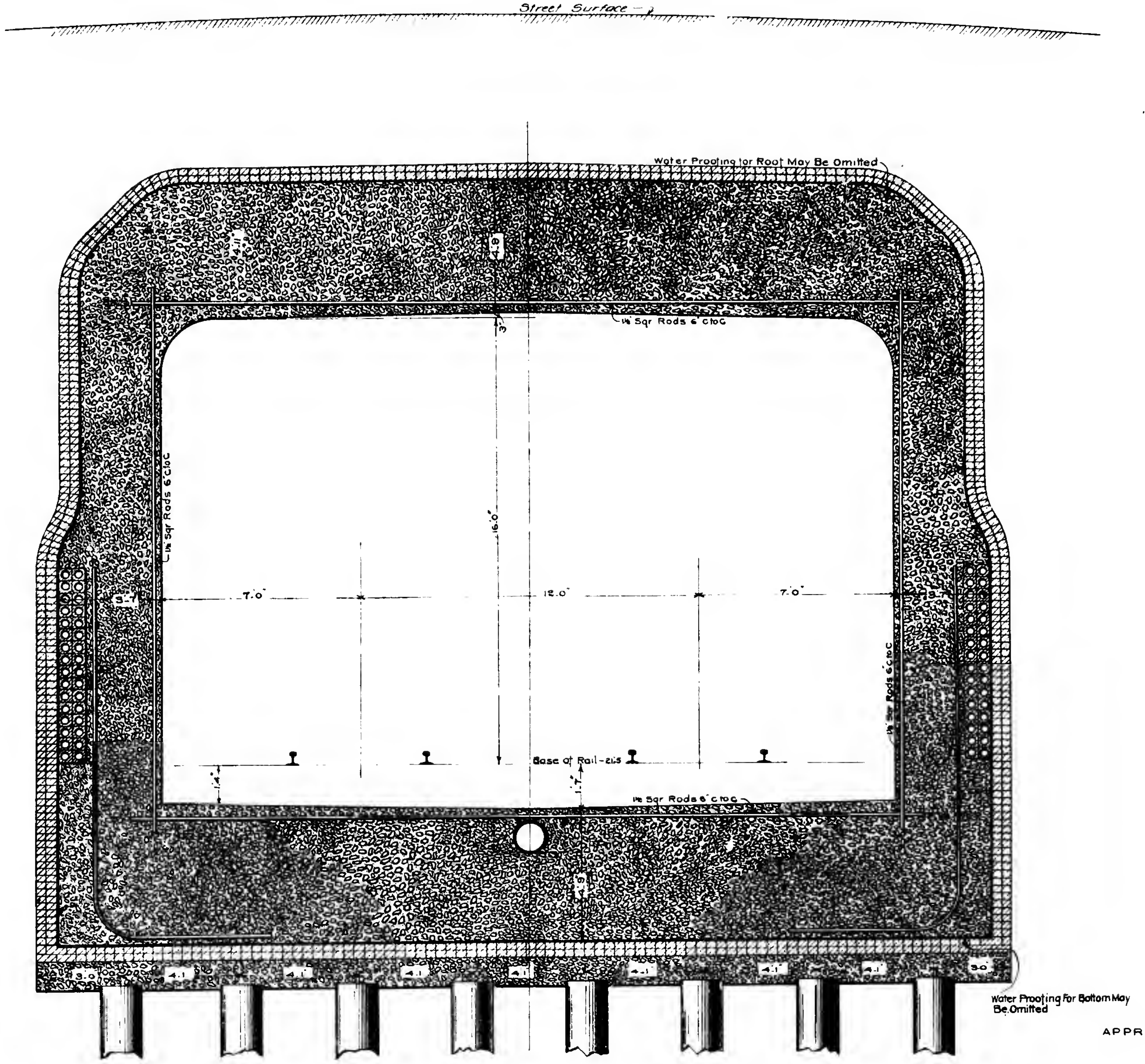
TO TERMINATE THE USE OF STREETS, AVENUES AND PUBLIC PLACES IN THE BOROUGH OF MANHATTAN.

ROUTES AND GENERAL PLAN

KEY MAP

ALTERNATIVE PLAN NO.2

APPROVED George S. Rice
CHIEF ENGINEER.



APPROVED George S. Rice
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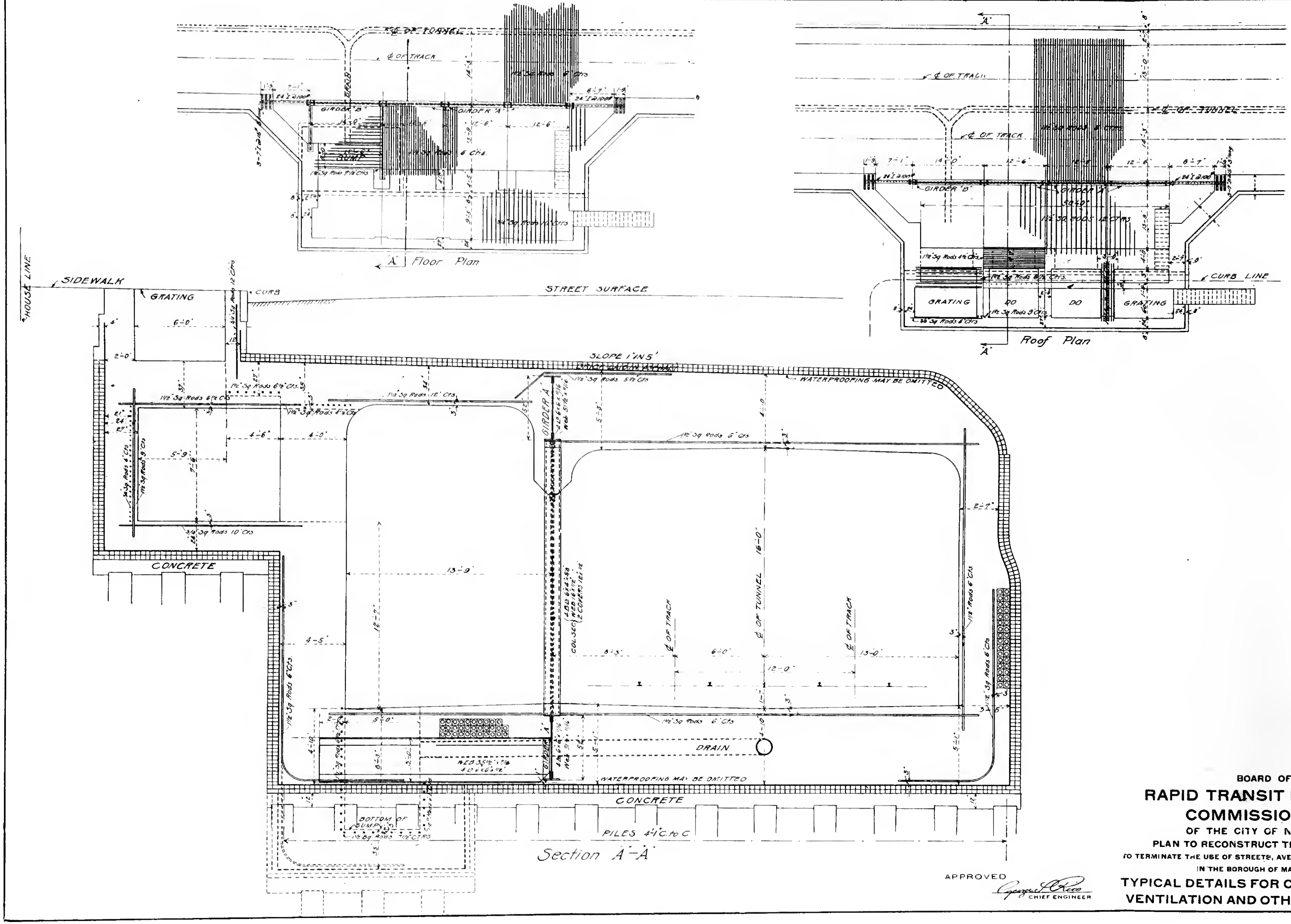
BOARD OF
RAPID TRANSIT RAILROAD COMMISSIONERS
OF THE CITY OF NEW YORK
PLAN TO RECONSTRUCT THE N.Y.C.&H.R.R.
TO TERMINATE THE USE OF STREETS, AVENUES AND PUBLIC PLACES
IN THE BOROUGH OF MANHATTAN.
TYPICAL CROSS SECTION
ALTERNATIVE PLAN NO.1&2



APPROVED
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CHIEF ENGINEER

BOARD OF
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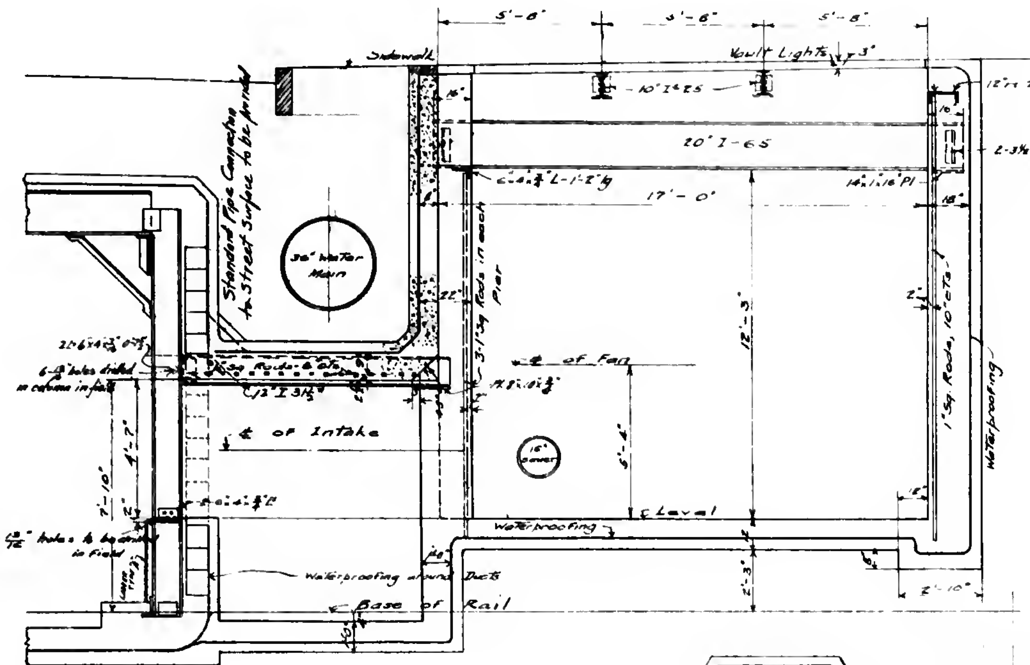
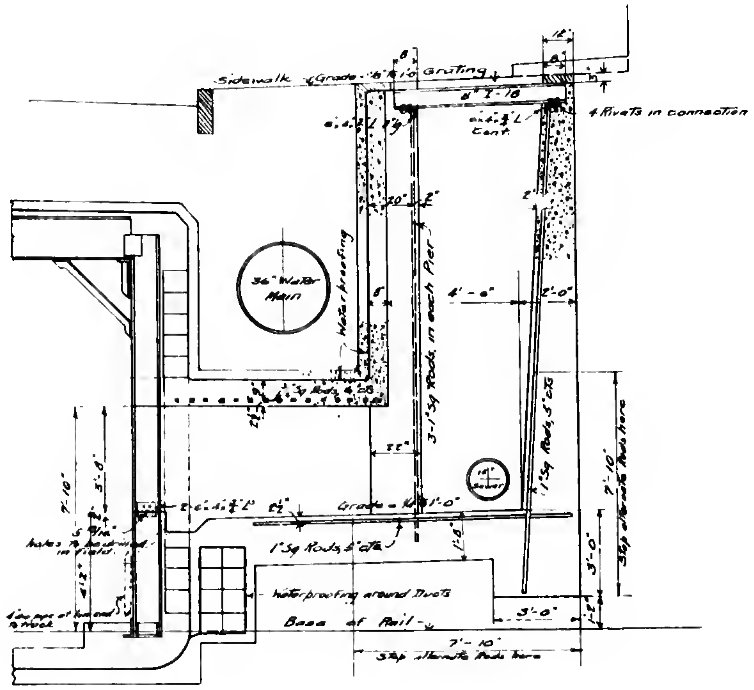
OF THE CITY OF NEW YORK
PLAN TO RECONSTRUCT THE N.Y.C.&H.R.R.
TO TERMINATE THE USE OF STREETS, AVENUES AND PUBLIC PLACES
IN THE BOROUGH OF MANHATTAN.

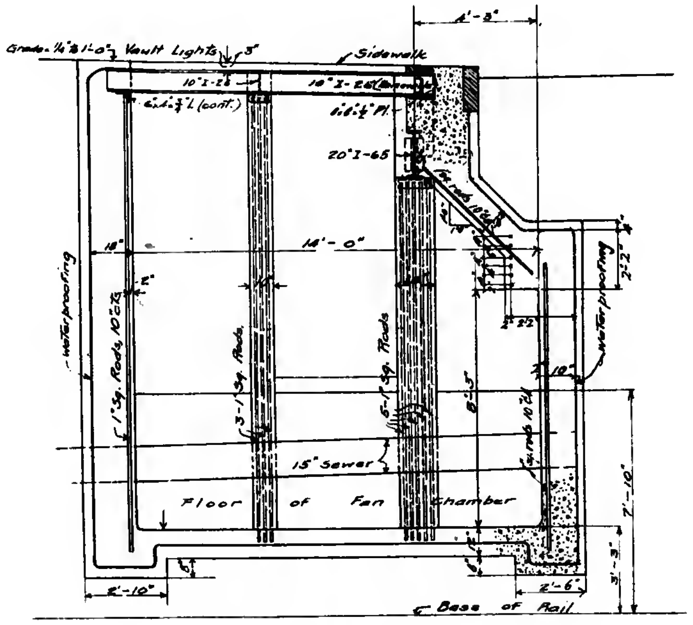
TYPICAL DETAILS FOR CHAMBERS FOR VENTILATION AND OTHER PURPOSES



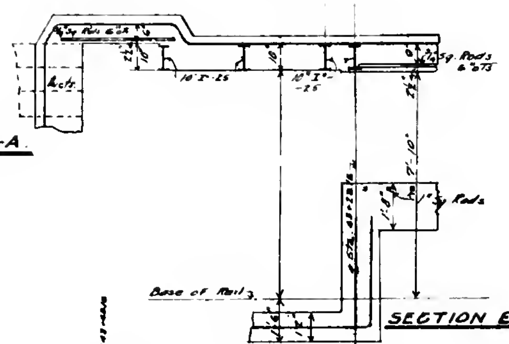
SECTION A-A



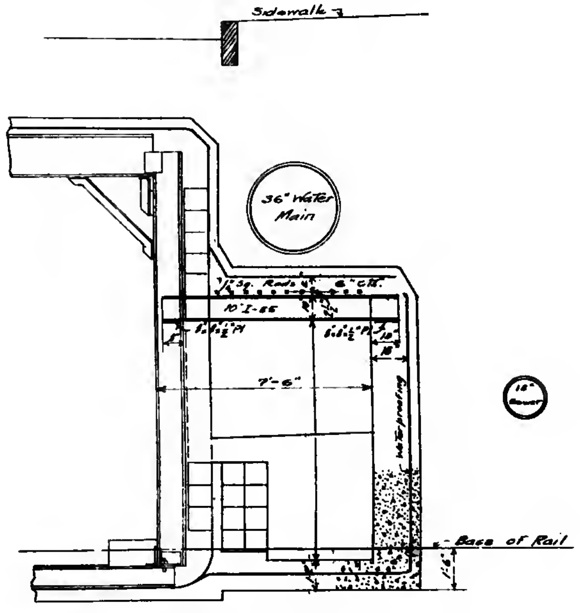
SECTION B-B



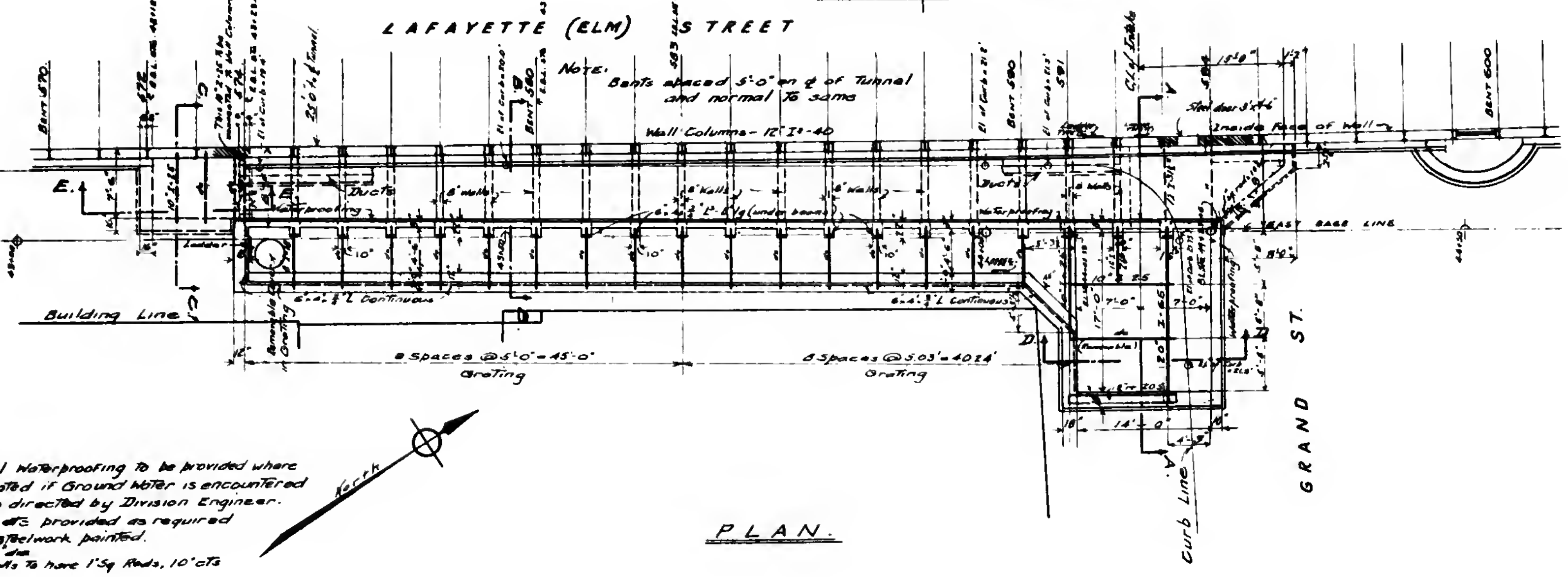
SECTION D-D



SECTION E-E



SECTION C-C



PLAN.

NOTE:
Additional Waterproofing to be provided where not indicated if Ground Water is encountered and if so directed by Division Engineer.
Ladder, etc. provided as required
Exposed steelwork painted.
Rivets 3/4" dia.
All 18" Walls to have 1"Sq Rods, 10" cts.

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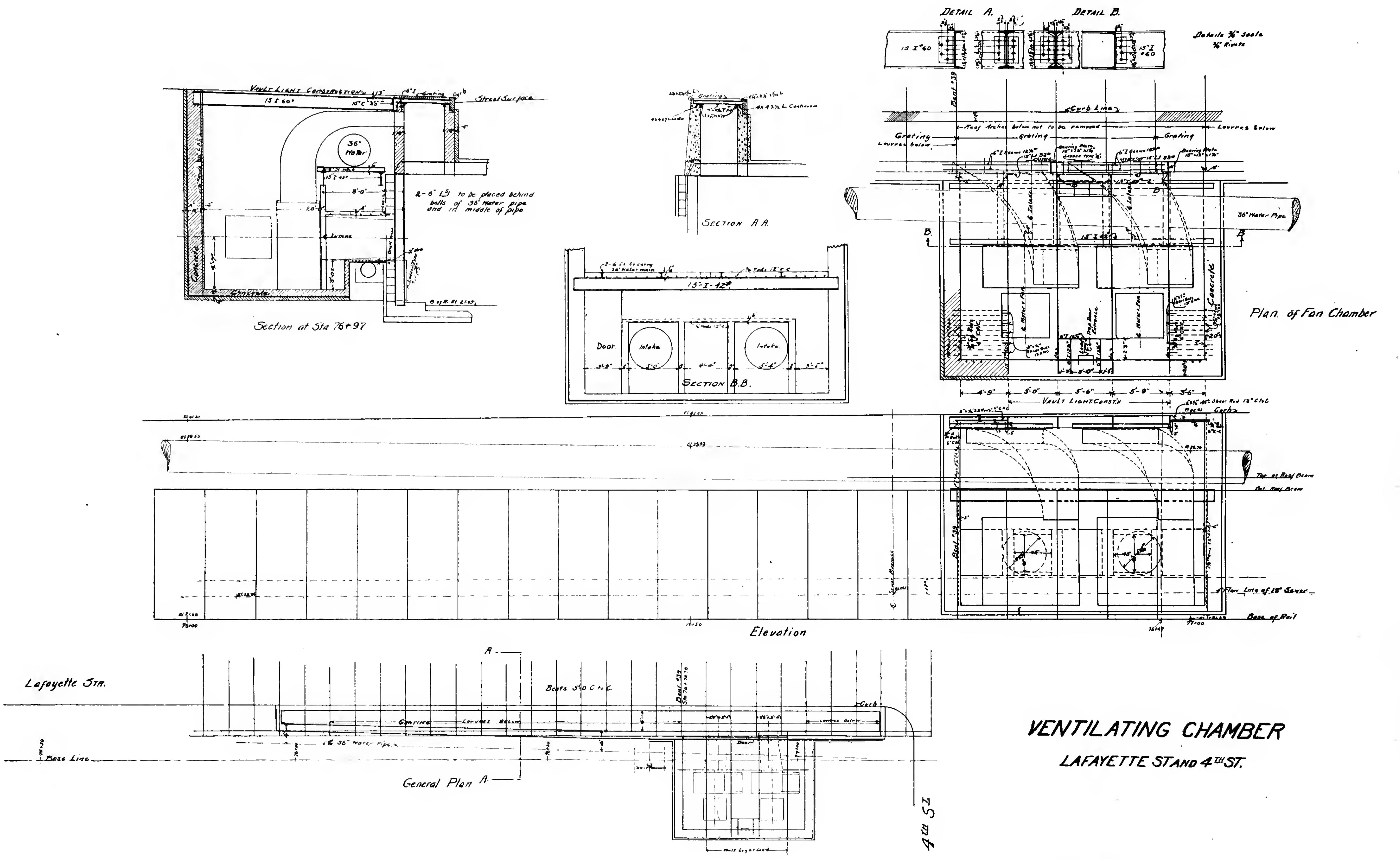
VENTILATING CHAMBER.
LAFAYETTE ST, GRAND ST. TO HOWARD ST.



VENTILATING CHAMBER

LAFAYETTE ST AND 4TH ST.

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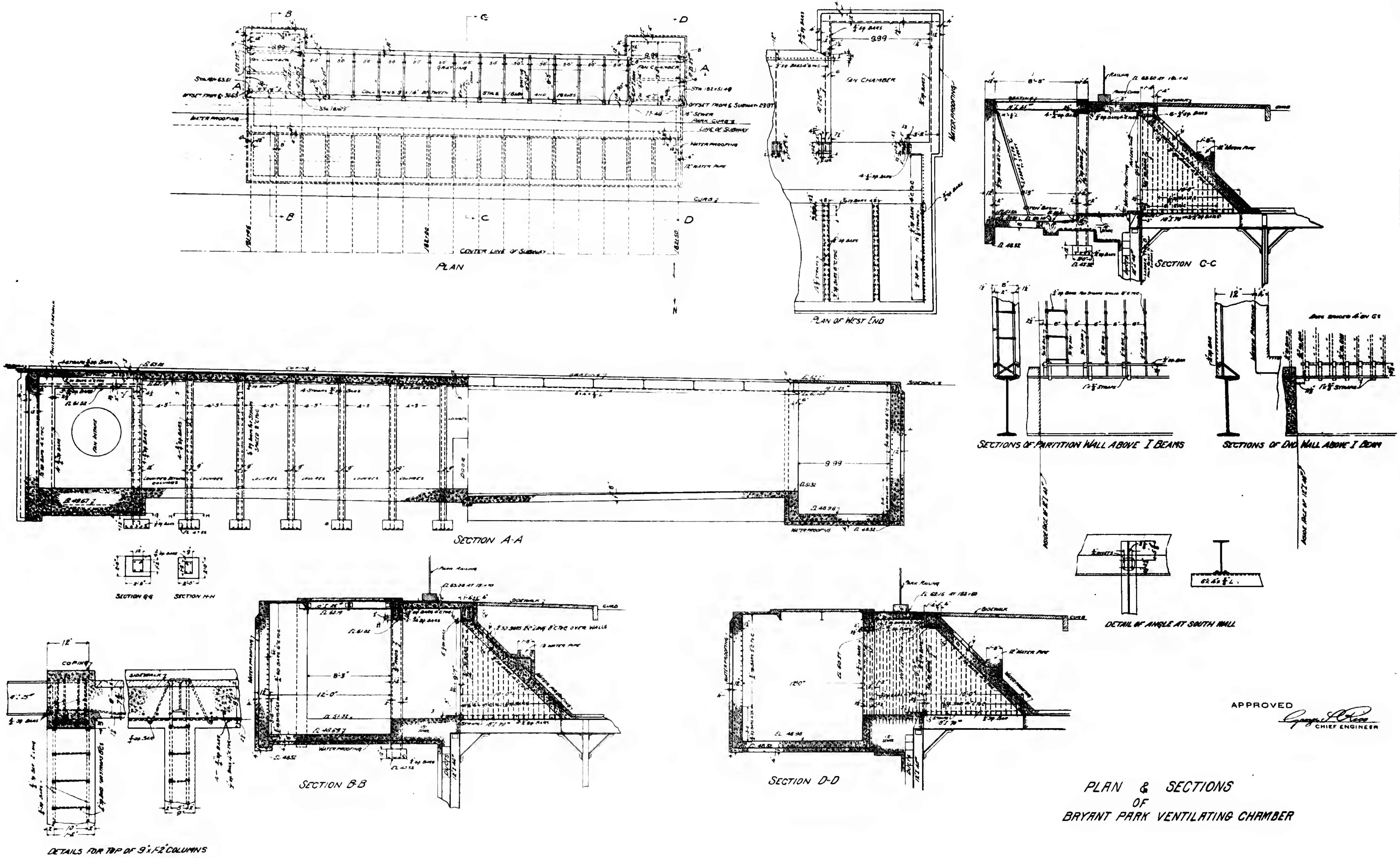

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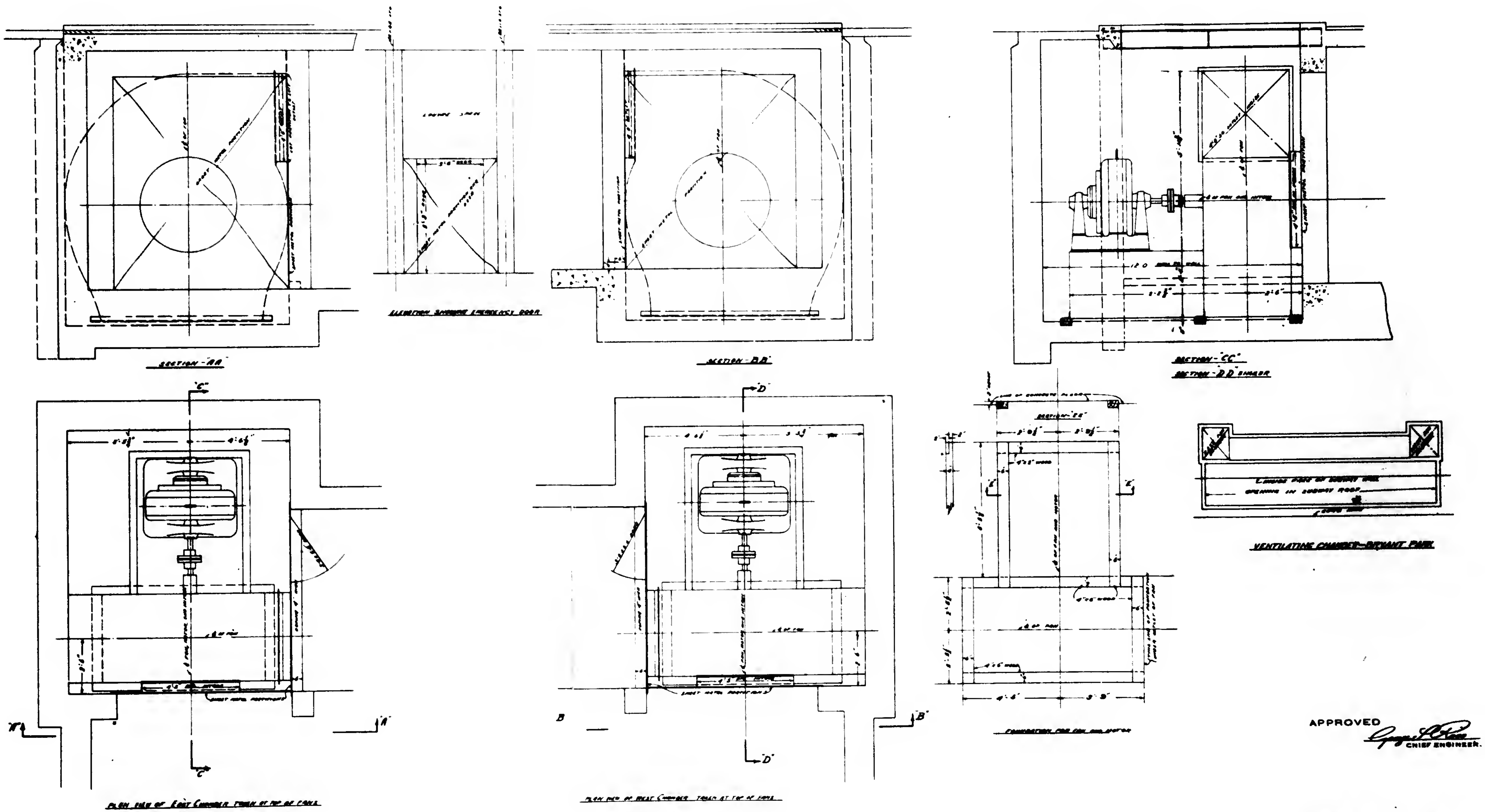
PLAN & SECTIONS
OF
BRYANT PARK VENTILATING CHAMBER


SECTION "AA"
ELEVATION SHOWING EMERGENCY DOOR
SECTION "BB"
SECTION "CC"
SECTION "DD" SIMILAR
"C"
"D"
"A"
B
"B"
"E"
SECTION "EE"
LINE OF CONCRETE FLOOR
4"×2" WOOD
4"×6" WOOD
SHEET METAL PARTITIONS
CENTRE LINE OF SUBWAY WALL
OPENING IN SUBWAY ROOF
VENTILATING CHAMBER—BRYANT PARK
PLAN VIEW OF EAST CHAMBER TAKEN AT TOP OF FANS
PLAN VIEW OF WEST CHAMBER TAKEN AT TOP OF FANS
FOUNDATION FOR FAN AND MOTOR

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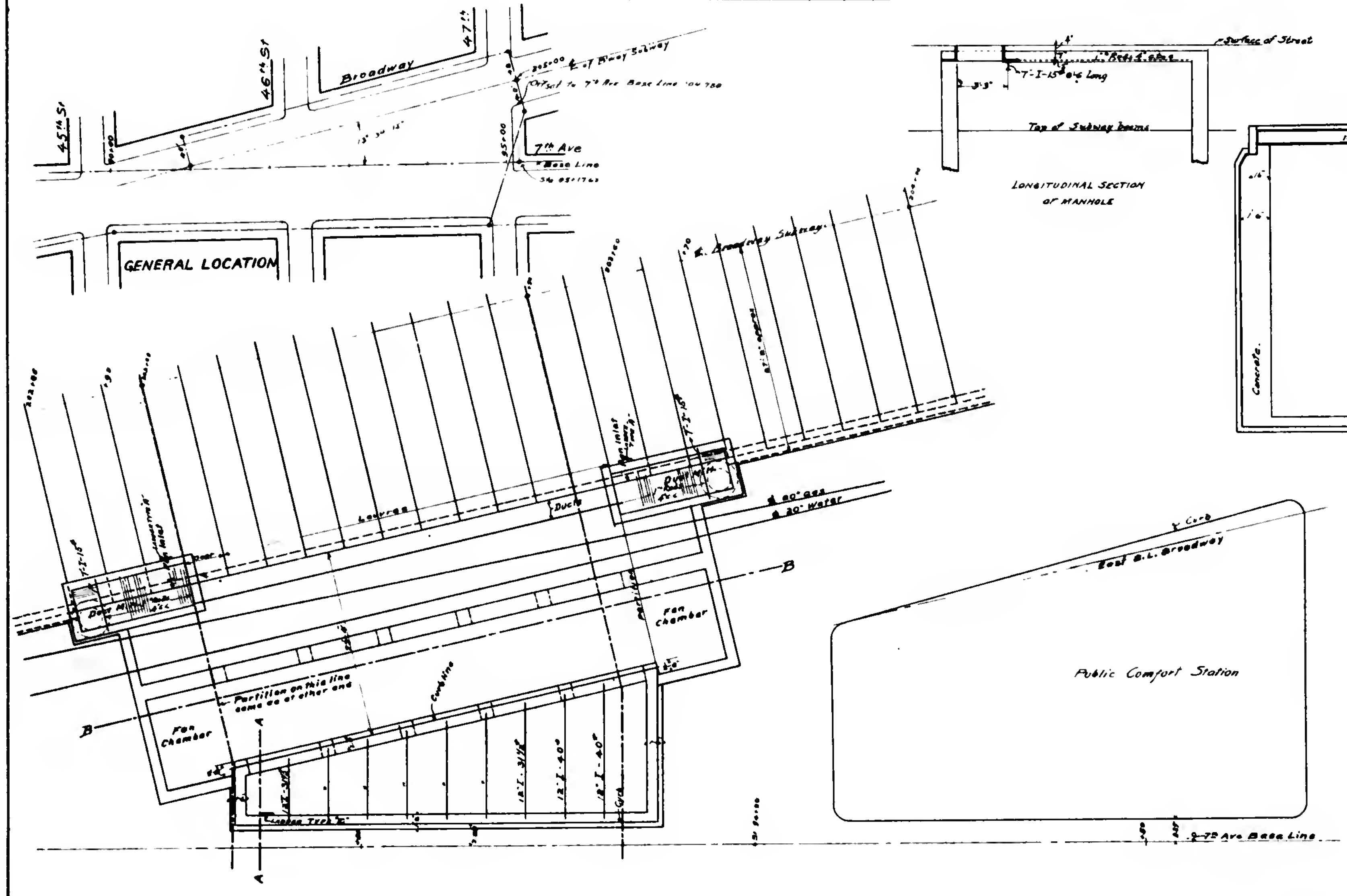
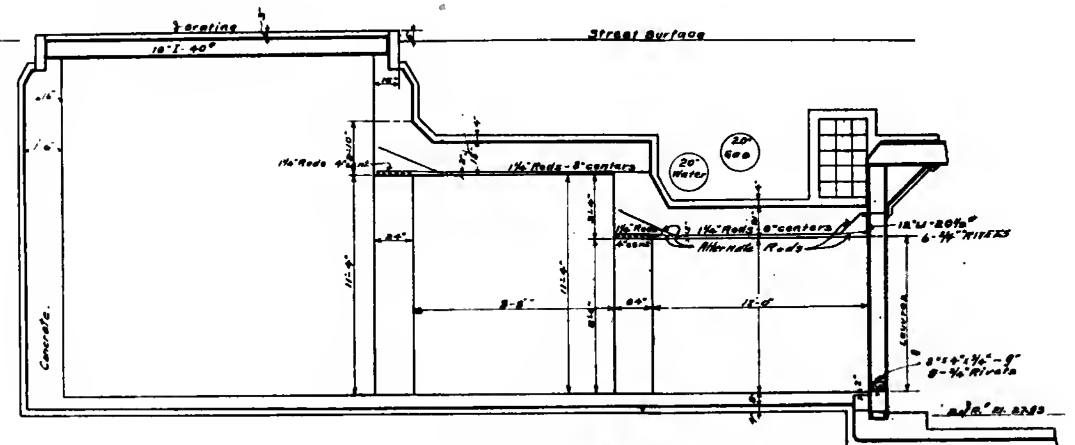
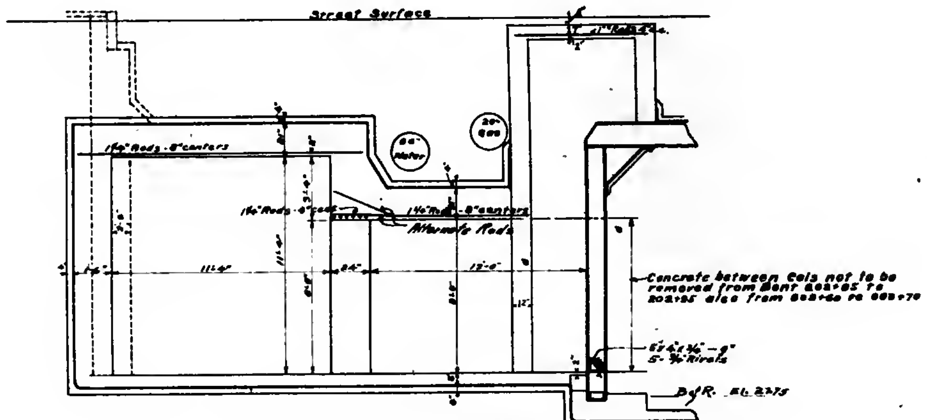
CHIEF ENGINEER.

PLAN & SECTIONS
OF
FAN CHAMBER AT BRYANT PARK



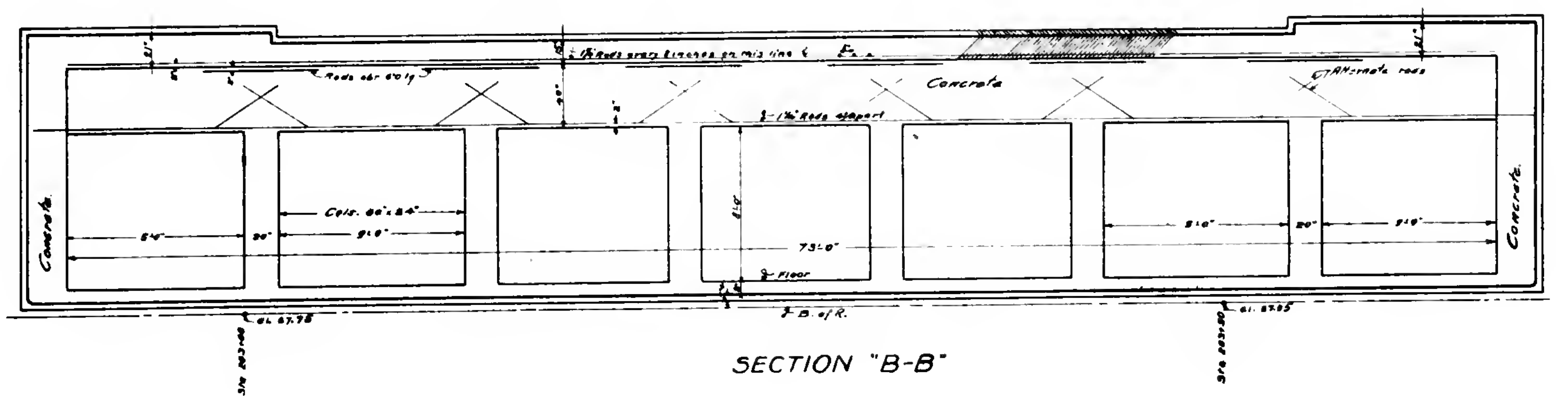


SECTION at St. 203+50

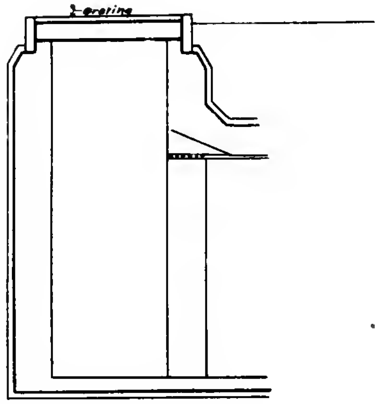

Street Surface
1¼" Rods 6" centers
Alternate Rods
20" Water
20" Gas
Concrete between Cols not to be removed from Bent 203+85 to 203+95 also from 203+60 to 203+70
B. of R. El. 67.75

SECTION at St. 203+00

Waterproofing to be used where ordered by Chief Engineer.



SECTION "B-B"



SECTION "A-A"

VENTILATING CHAMBER

46TH ST. TO 47TH ST. ON BROADWAY.

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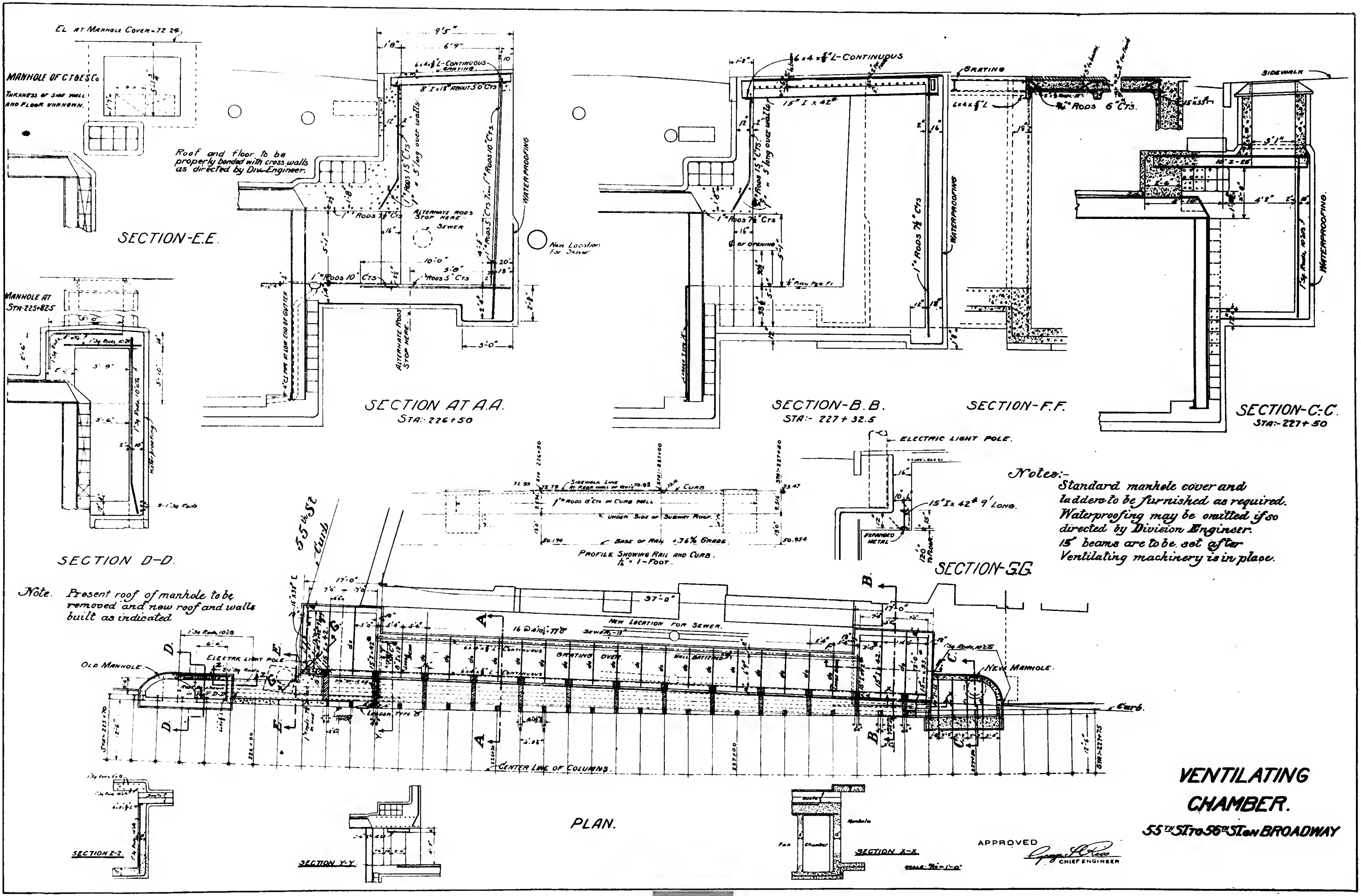


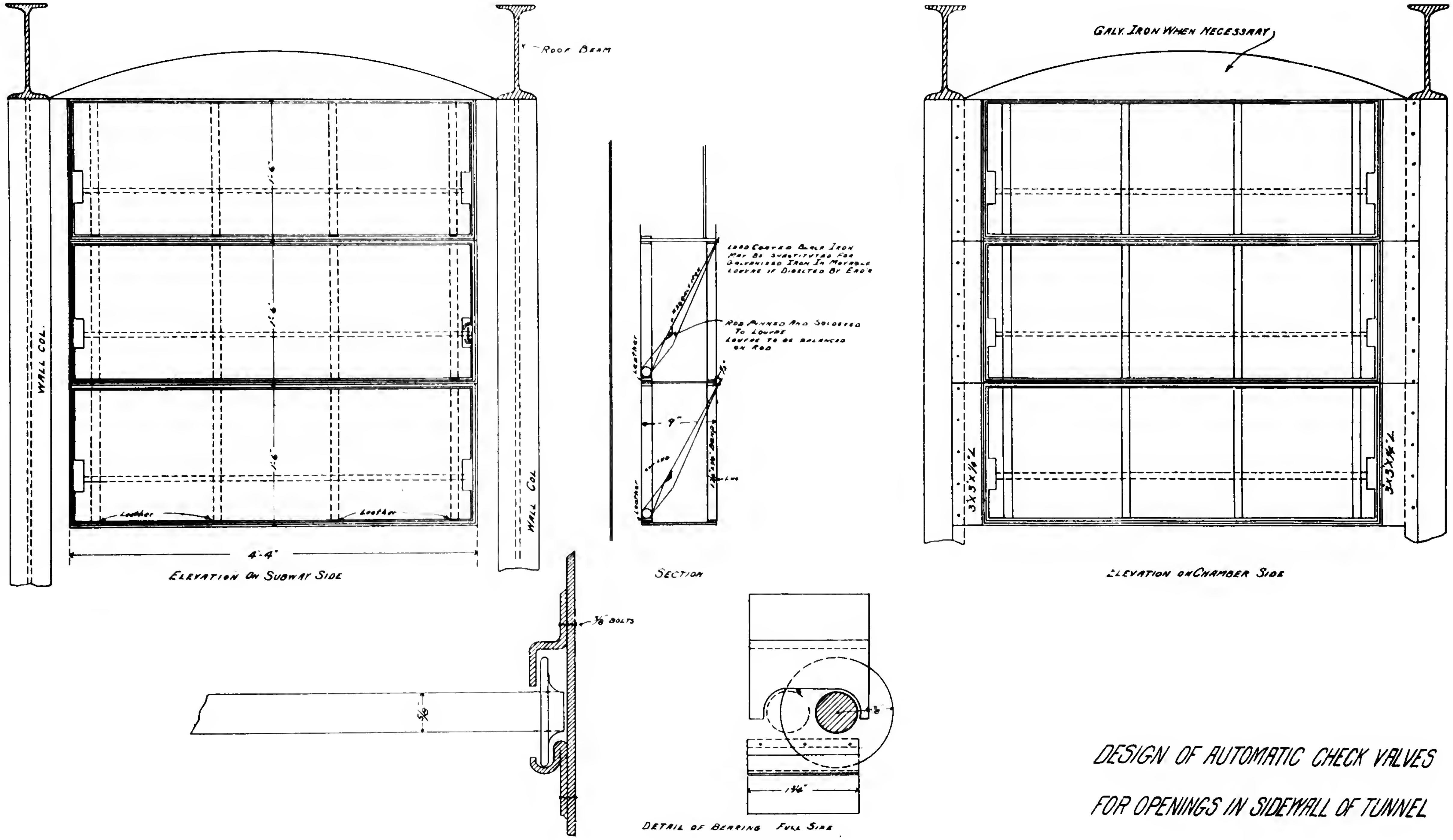
Note. Present roof of manhole to be removed and new roof and walls built as indicated.

Notes:-
Standard manhole cover and ladders to be furnished as required.
Waterproofing may be omitted if so directed by Division Engineer.
15" beams are to be set after Ventilating machinery is in place.

VENTILATING CHAMBER.

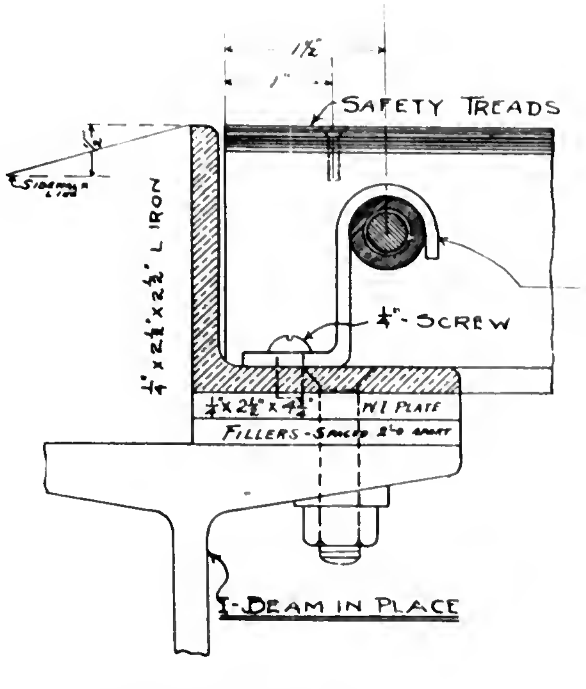
55th St. to 56th St. on BROADWAY

APPROVED
George S. Rice
CHIEF ENGINEER


Roof Beam
Wall Col.
1'-6"
1'-6"
1'-6"
Leather
Leather
4'-4"
Wall Col.
Elevation On Subway Side
Lead Coated Black Iron May Be Substituted For Galvanized Iron In Movable Louvre If Directed By Eng'r
Rod Pinned And Soldered To Louvre
Louvre To Be Balanced On Rod
Leather
Leather
9"
Section
Galv. Iron When Necessary
3×3×¼ L
3×3×¼ L
Elevation on Chamber Side
⅜" Bolts
5/16
1¼"
Detail of Bearing Full Size

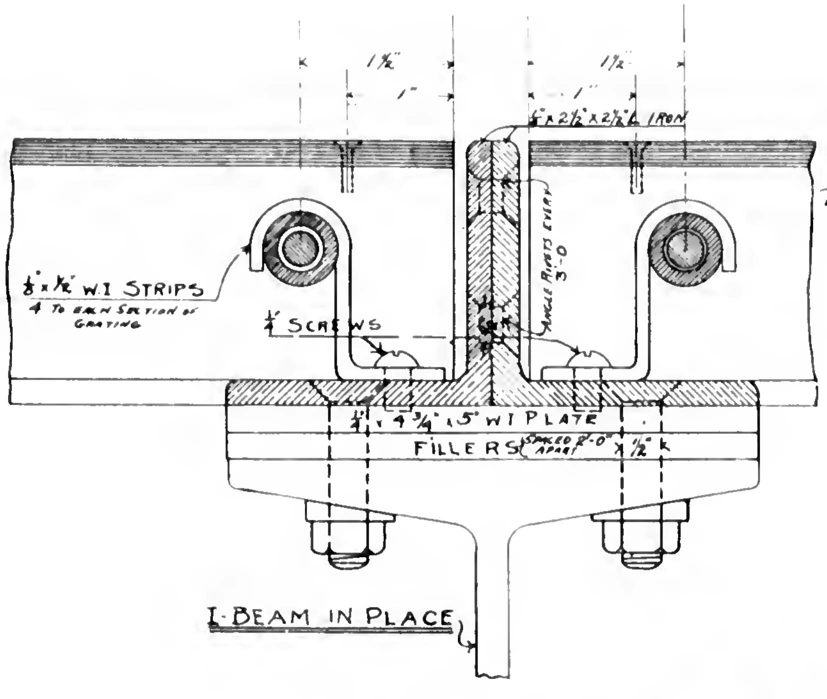
DESIGN OF AUTOMATIC CHECK VALVES
FOR OPENINGS IN SIDEWALL OF TUNNEL

APPROVED
George S. Rice
CHIEF ENGINEER

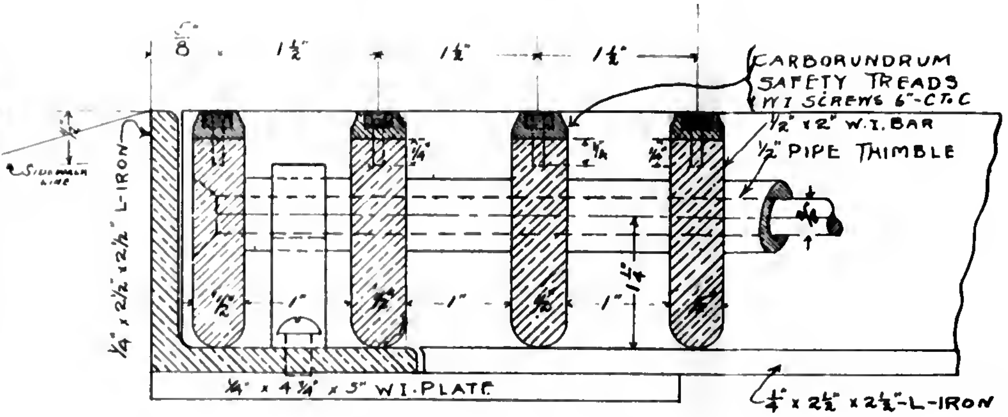


-SECTION-A-A-

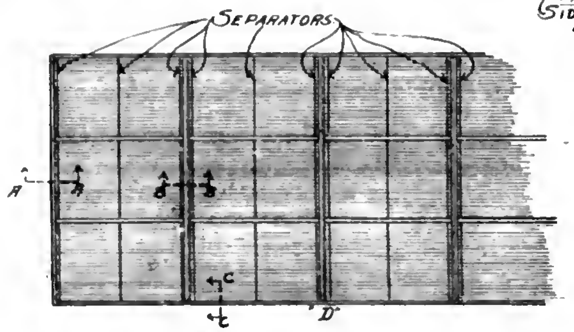
WITH BEAM UNDER



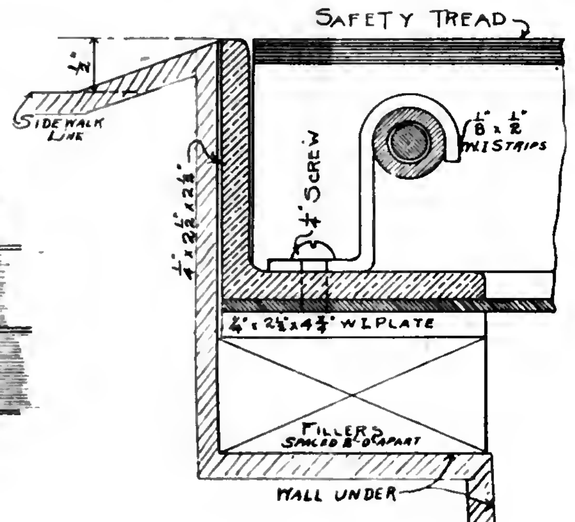
-SECTION-B-B-



-SECTION-C-C-

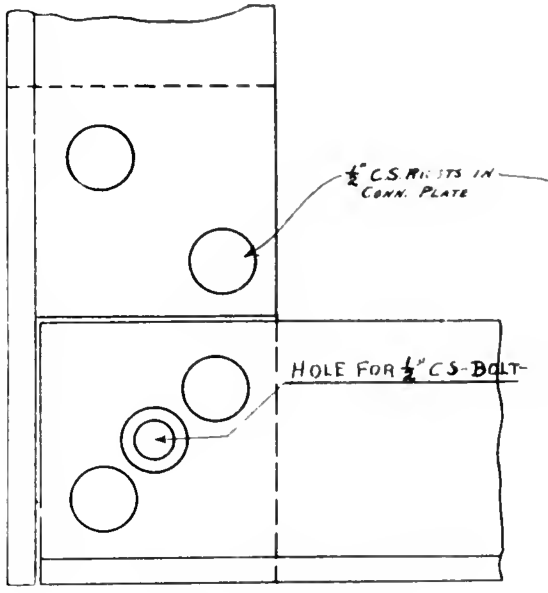


TYPICAL PLAN

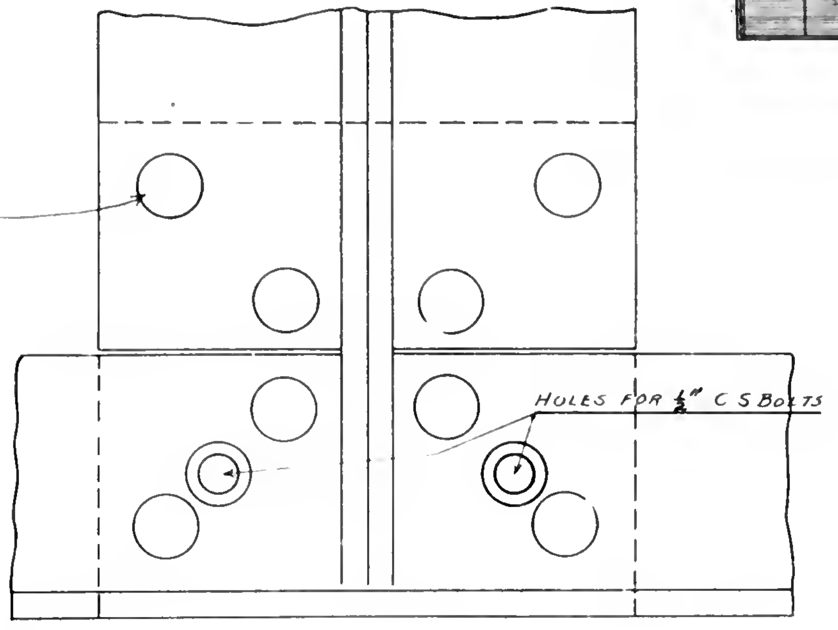


-SECTION-"A-A"-

WITH WALL UNDER



PLAN OF CORNER CONNECTION OF ANGLE FRAME



PLAN OF CONNECTION D

TYPICAL DETAILS
OF
SIDEWALK GRATINGS & FRAMES

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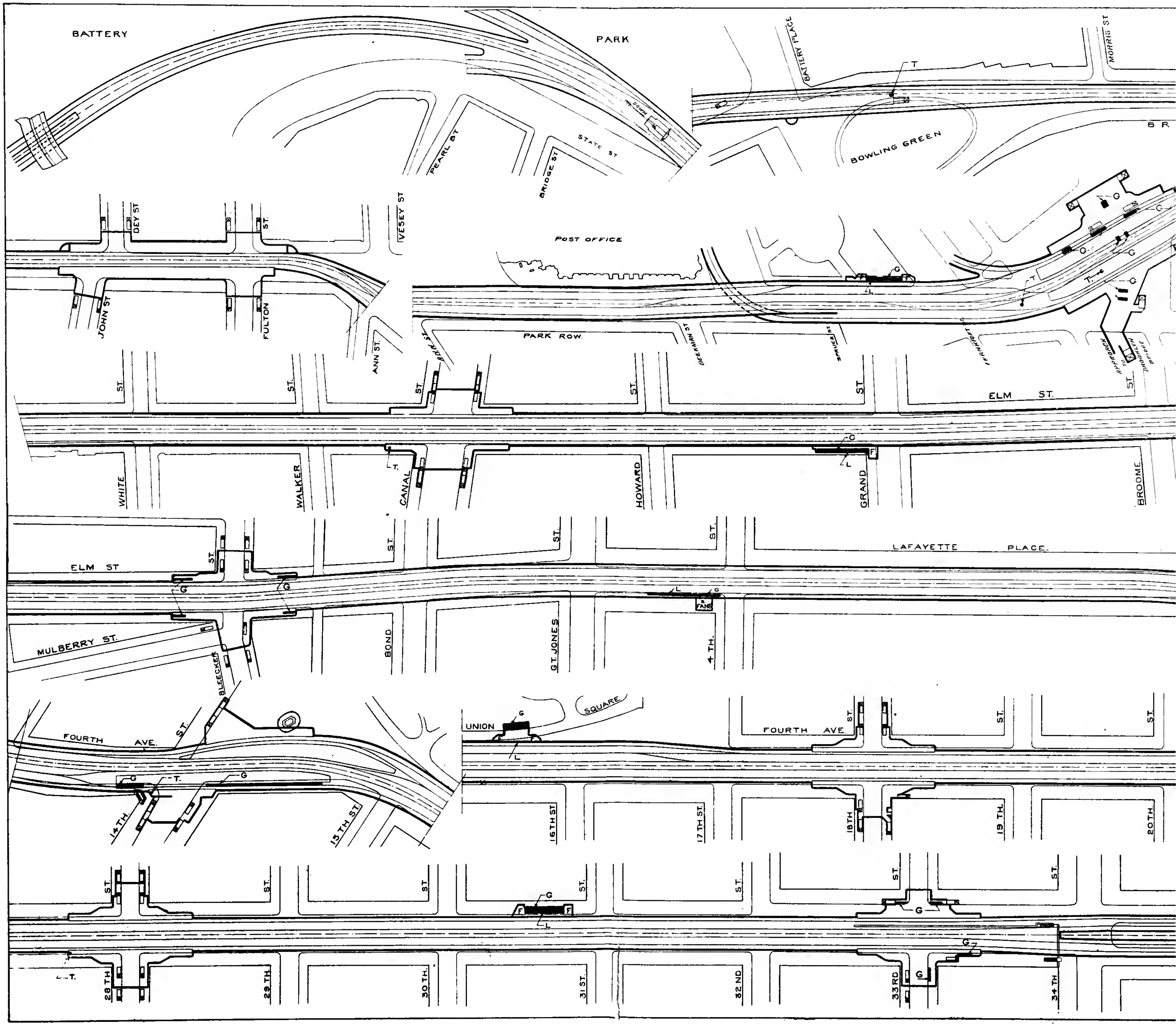
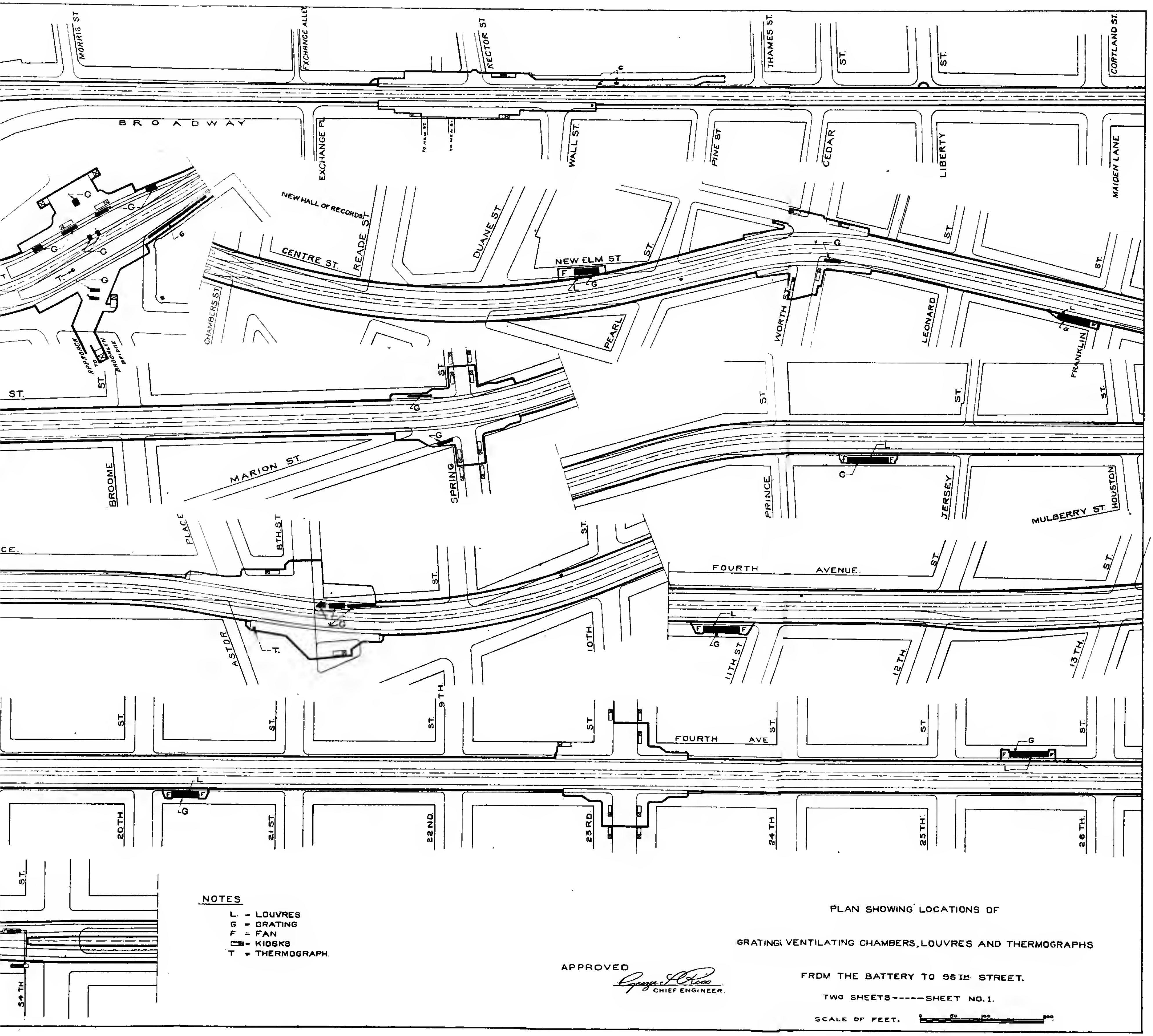
CHIEF ENGINEER


BATTERY
PARK
BATTERY PLACE
MORRIS ST
B R
T
BOWLING GREEN
PEARL ST
STATE ST
BRIDGE ST
DOWN
DEY ST
ST.
VESEY ST
POST OFFICE
JOHN ST
FULTON
ANN ST.
PARK ROW.
BEEKMAN ST
SPRUCE ST
FRANKFORT
APPROACH TO BROOKLYN BRIDGE
G
L
F
T
ST.
ELM ST.
WHITE
WALKER
CANAL
HOWARD
GRAND
BROOME
ELM ST
LAFAYETTE PLACE.
MULBERRY ST.
BLEECKER
BOND
GT. JONES
4 TH.
FANS
FOURTH AVE.
UNION
SQUARE
14TH.
15TH ST.
16TH ST
17TH ST.
18TH
19 TH.
20TH.
28TH
29TH.
30TH.
31 ST.
32 ND
33 RD
34 TH



NOTES

L. = LOUVRES
G = GRATING
F = FAN
▭ = KIOSKS
T = THERMOGRAPH.

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CHIEF ENGINEER.

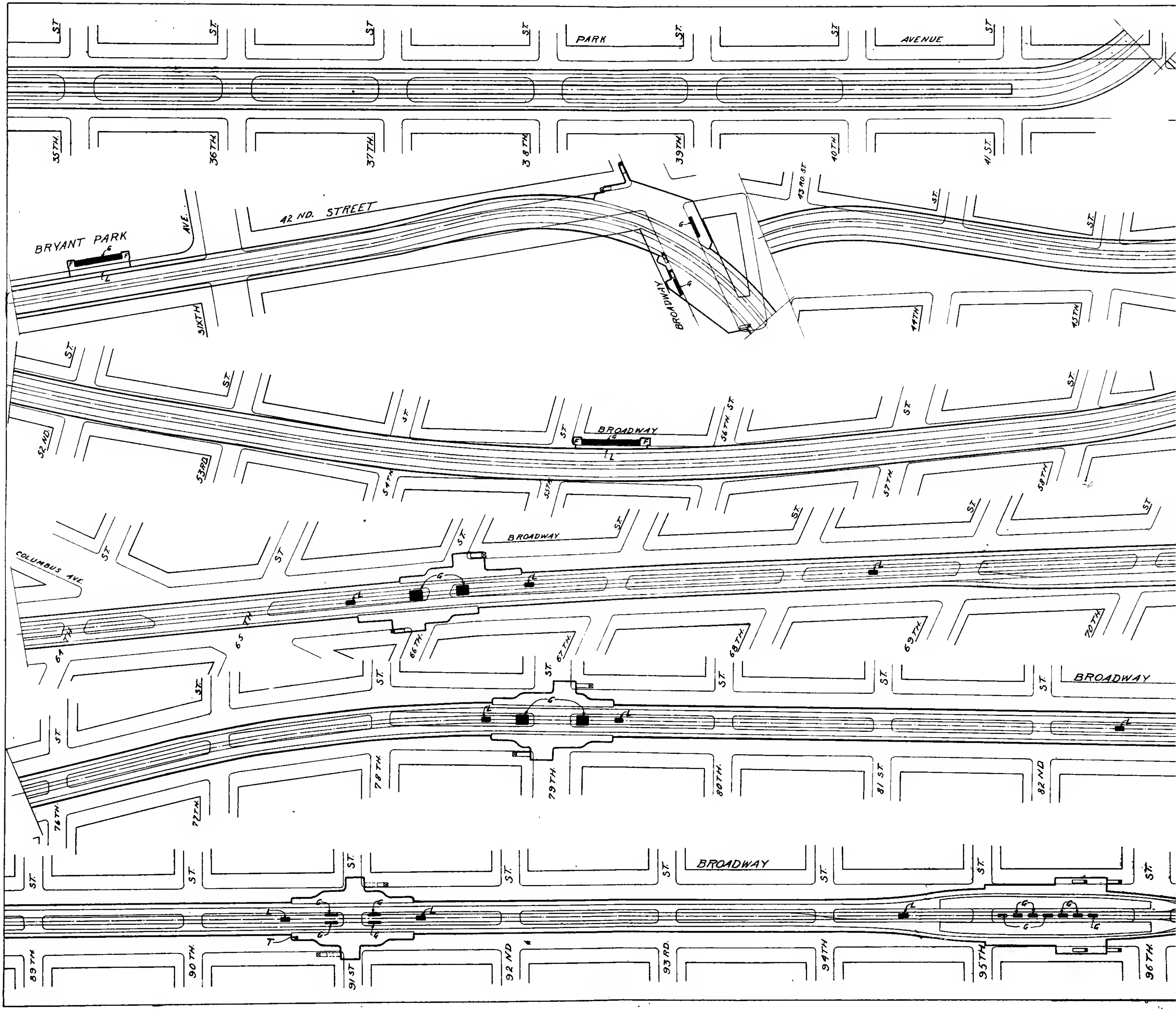
PLAN SHOWING LOCATIONS OF

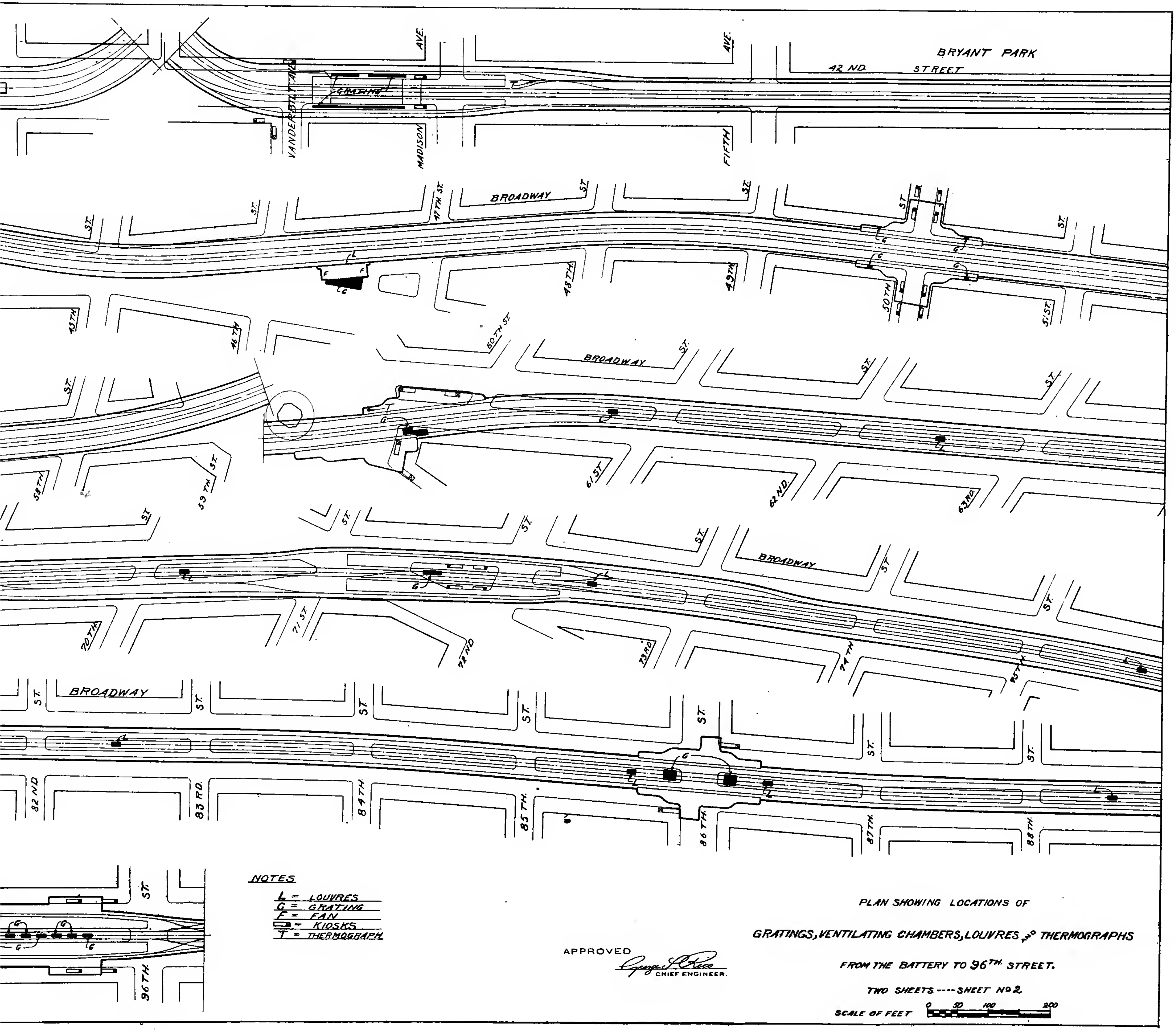
GRATING, VENTILATING CHAMBERS, LOUVRES AND THERMOGRAPHS

FROM THE BATTERY TO 96TH STREET.

TWO SHEETS------SHEET NO. 1.

SCALE OF FEET. 0 50 100 200


PARK
AVENUE
ST.
35TH
36TH
37TH
38TH
39TH
40TH
41 ST.
43 RD ST.
BRYANT PARK
AVE.
42 ND. STREET
SIXTH
BROADWAY
44TH
45TH
G
F
L
52 ND.
53RD
54TH
55TH
56TH ST.
57TH
58TH
BROADWAY
COLUMBUS AVE.
64
65
TH
66TH.
67TH.
68TH.
69TH
70TH
BROADWAY
76TH.
77TH.
78TH
79TH
80TH.
81 ST
82 ND
BROADWAY
89TH
90TH
91 ST
92 ND
93 RD.
94TH
95TH
96TH
T



NOTES

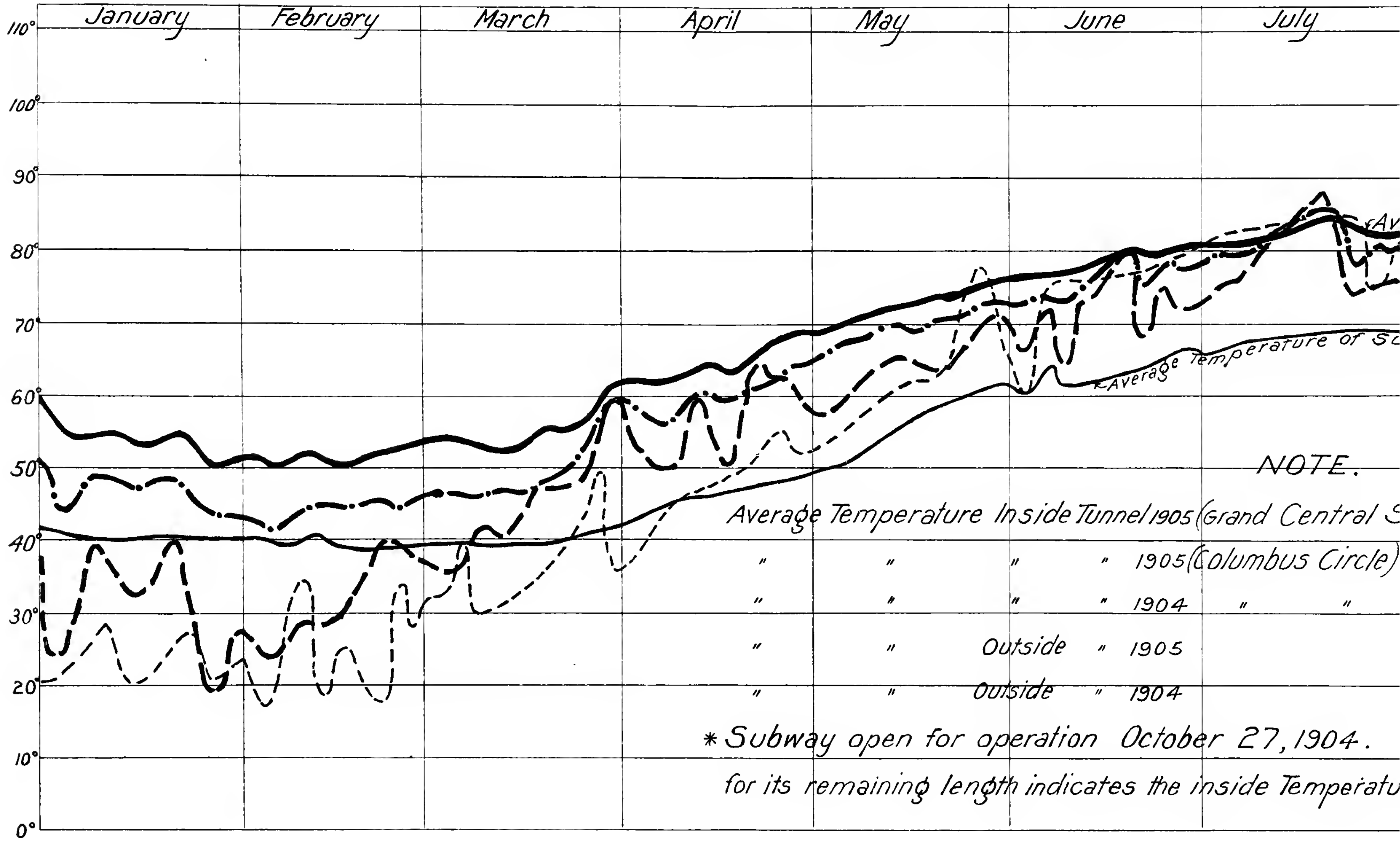
L = LOUVRES
G = GRATING
F = FAN
▭ = KIOSKS
T = THERMOGRAPH

APPROVED
George S Rice
CHIEF ENGINEER.

PLAN SHOWING LOCATIONS OF
GRATINGS, VENTILATING CHAMBERS, LOUVRES AND THERMOGRAPHS
FROM THE BATTERY TO 96TH. STREET.
TWO SHEETS ---- SHEET NO 2
SCALE OF FEET

TEMPERATURE CHA

Years 1904–1905.



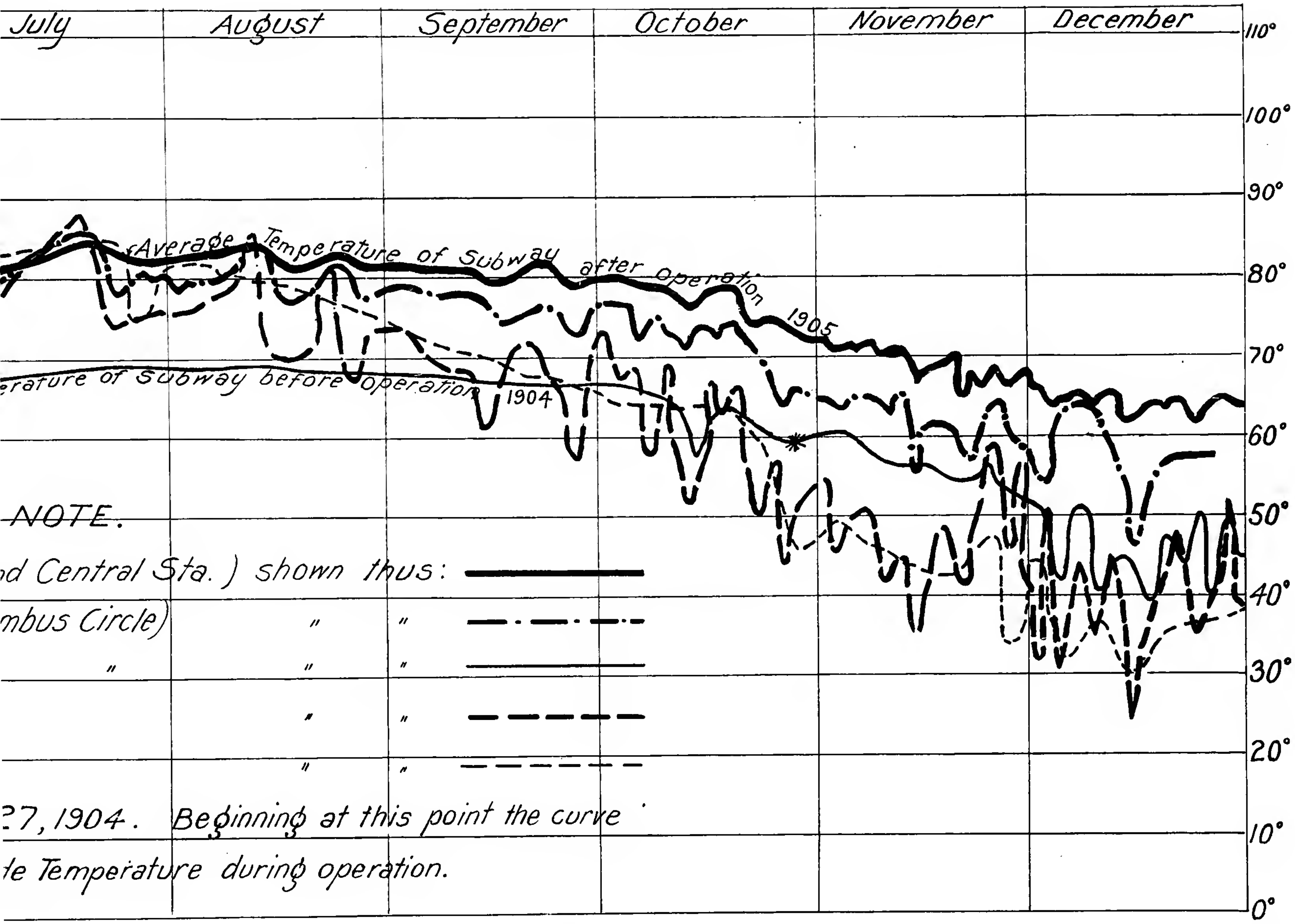
NOTE.

This Chart is designed to show, in a general way, the relative variations in temperature inside and out
changes, inside the Tunnel, resulting from the operation of trains. The thermometer at Columbus Circ
about 70' West of South Bound Train Platform between South Bound Local and Express Tracks and giv
and intermediate points.

E CHART.

CHART No 3

905.



E.

ide and outside of Tunnel for the years 1904 and 1905, with the particular object of showing the umbus Circle is at the South end of West Platform, while that at Grand Central Station is cks and gives the approximate average temperature throughout the subway, at Stations

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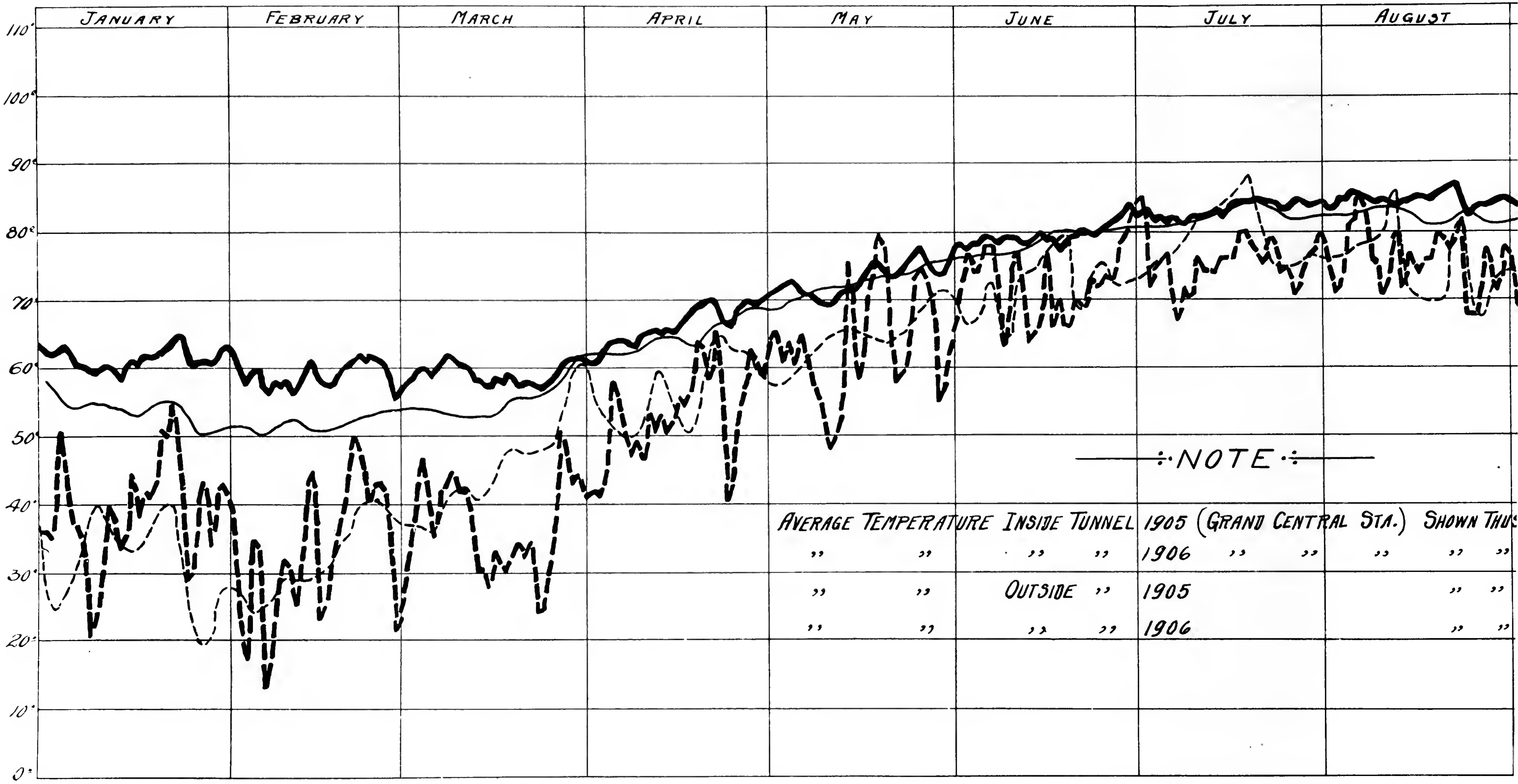
CHIEF ENGINEER

TEMPERATURE CHART

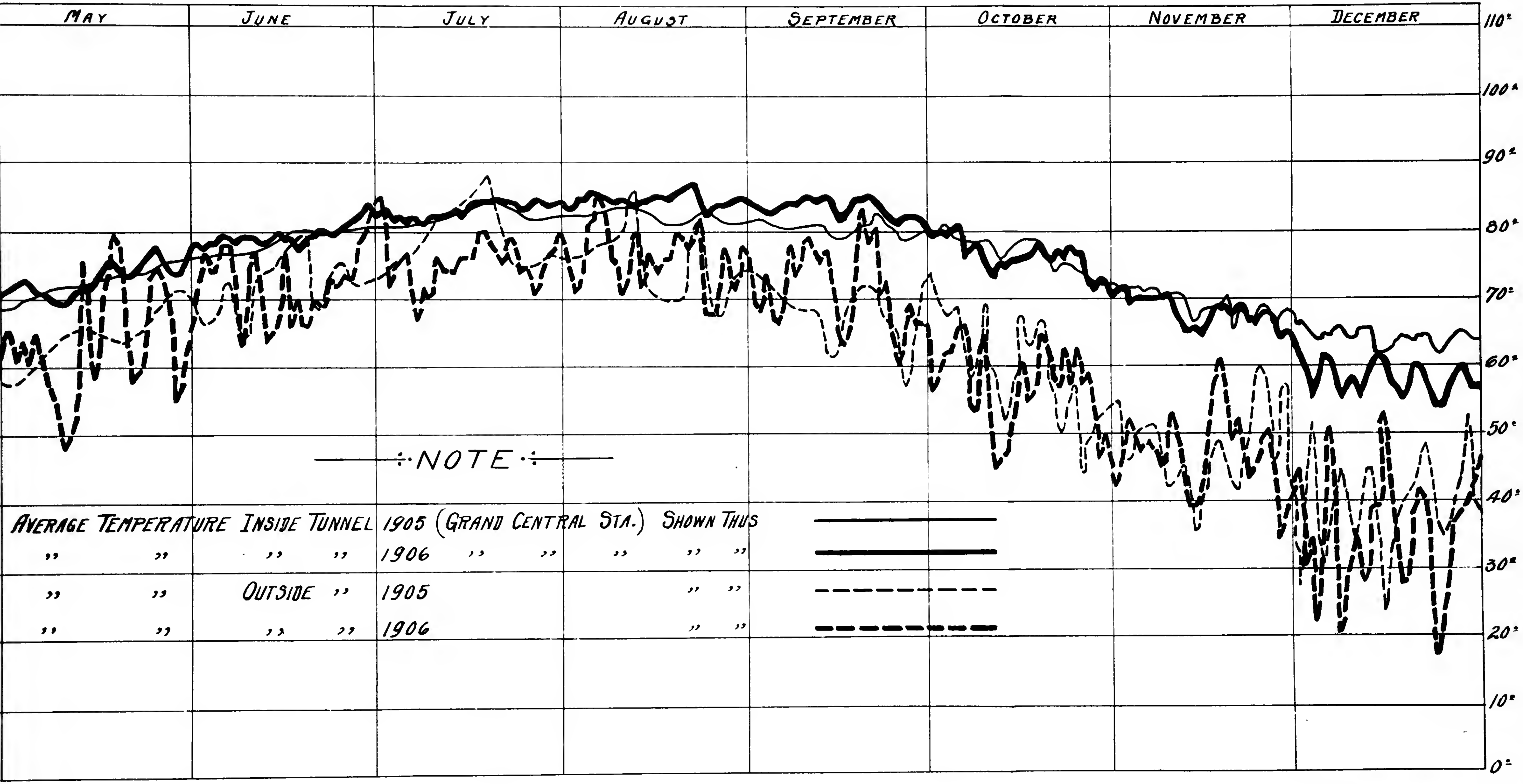
Years 1905 - 1906



LOCATION OF THERMOMETERES THE SAME AS GIVEN ON CHART NUMBER

TEMPERATURE CHART
Years 1905-1906

CHART No 4



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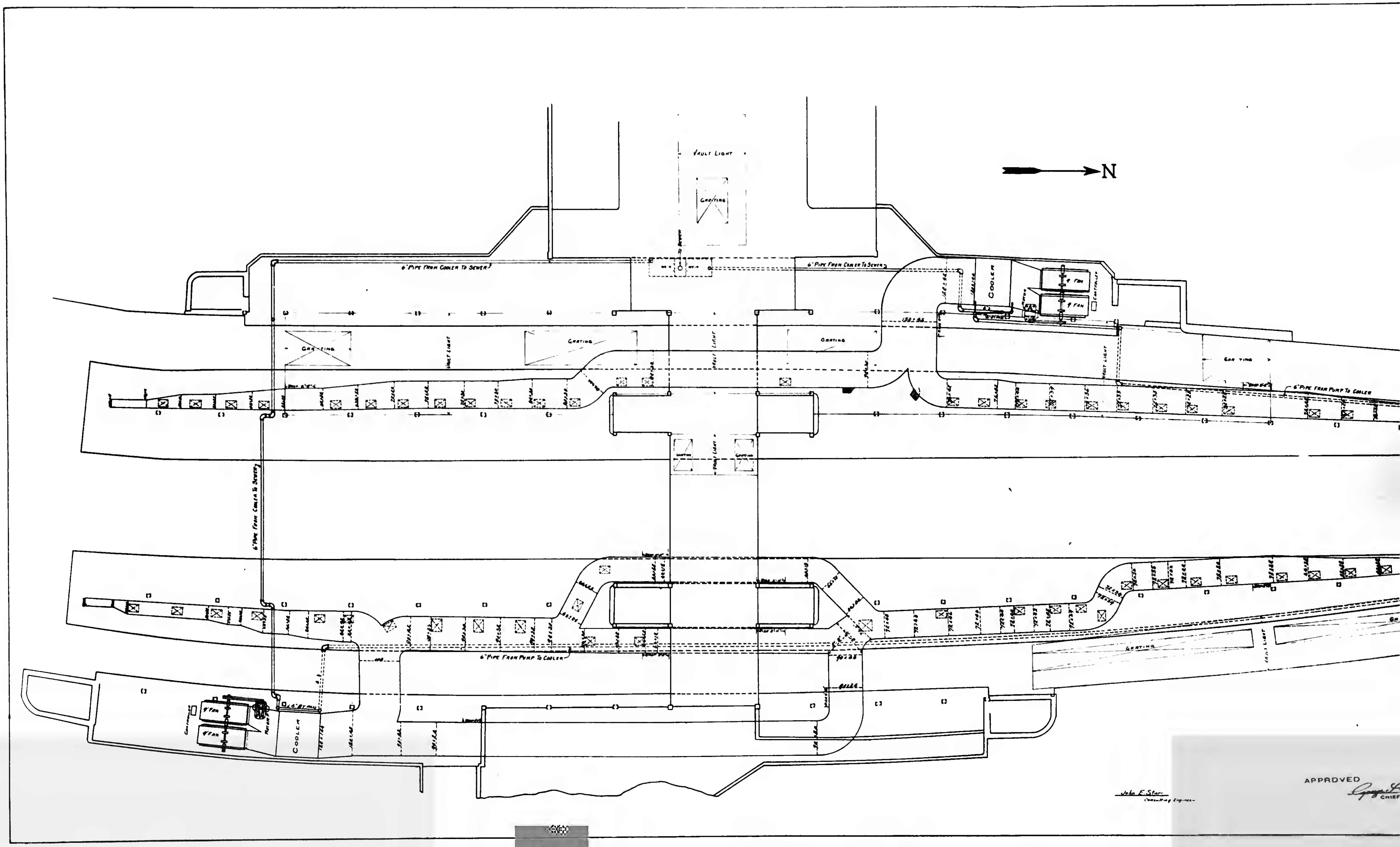
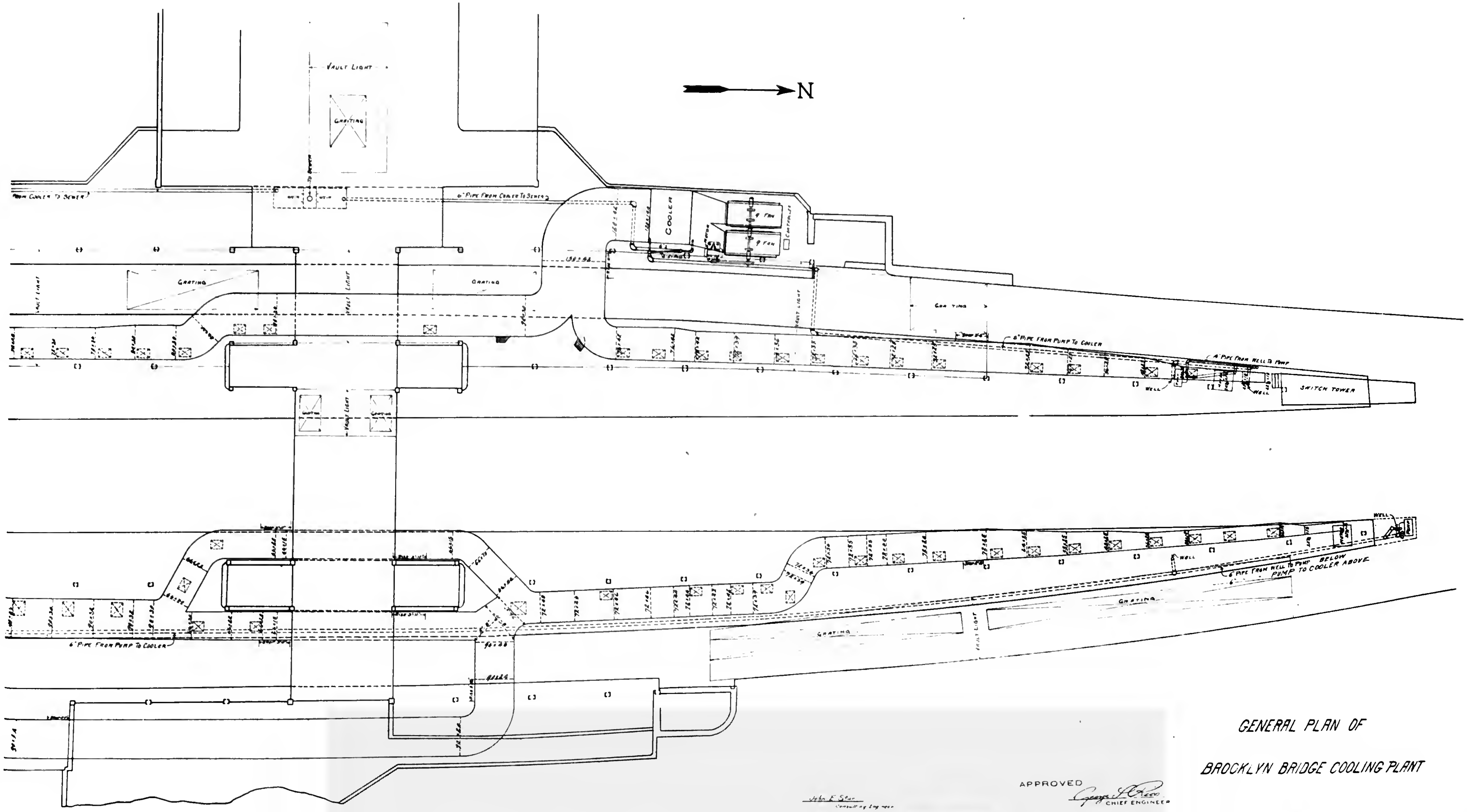
ERMOMETERES THE SAME AS GIVEN ON CHART NUMBER 3



John F. Starr
Consulting Engineer

APPROVED
CHIEF



GENERAL PLAN OF

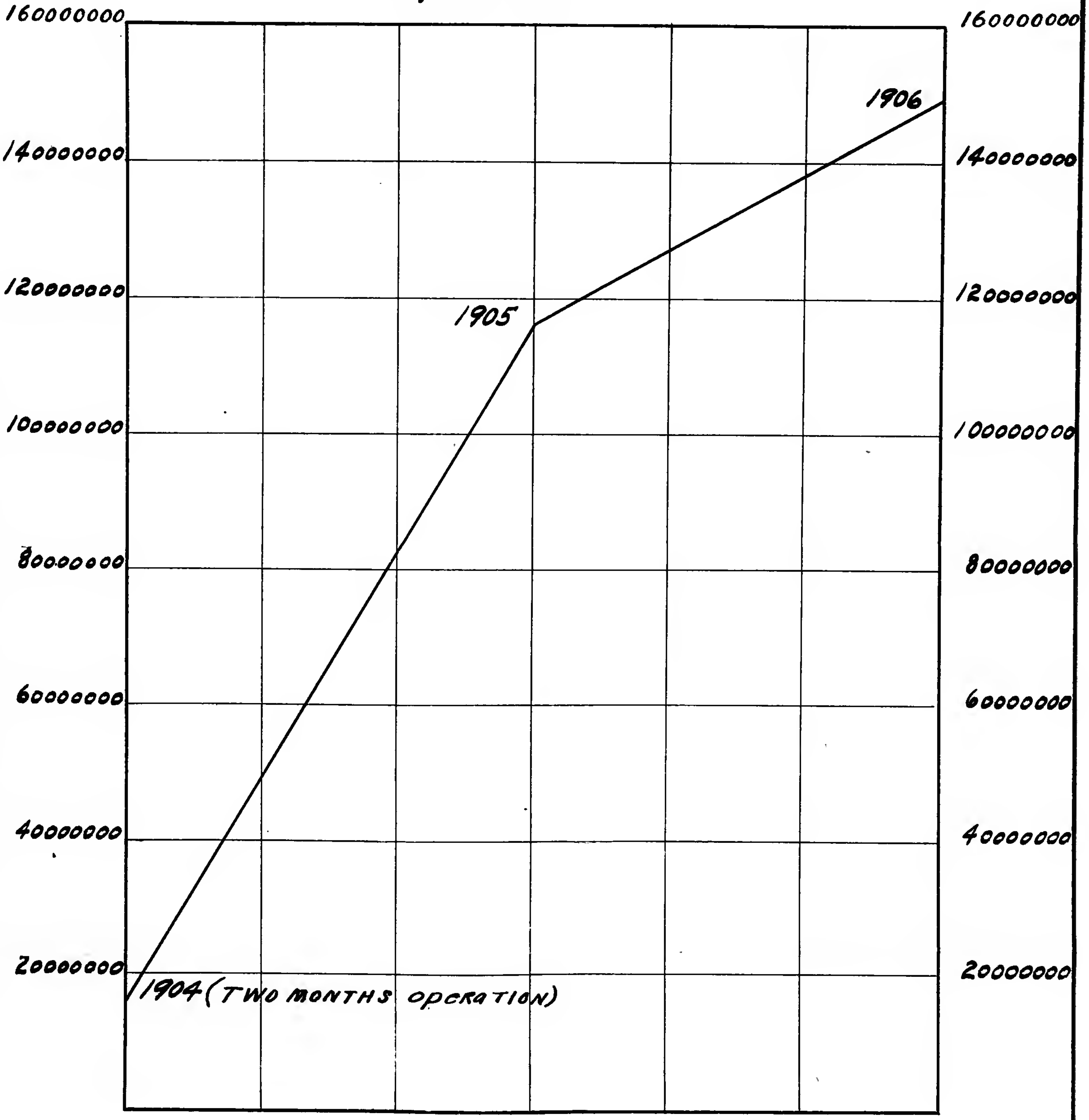
BROOKLYN BRIDGE COOLING PLANT

John F. Starr
Consulting Engineer

APPROVED George S. Rice
CHIEF ENGINEER

CHART A

PASSENGER TRAFFIC
YEARLY TOTAL VARIATION CHART FOR
1904-5-6



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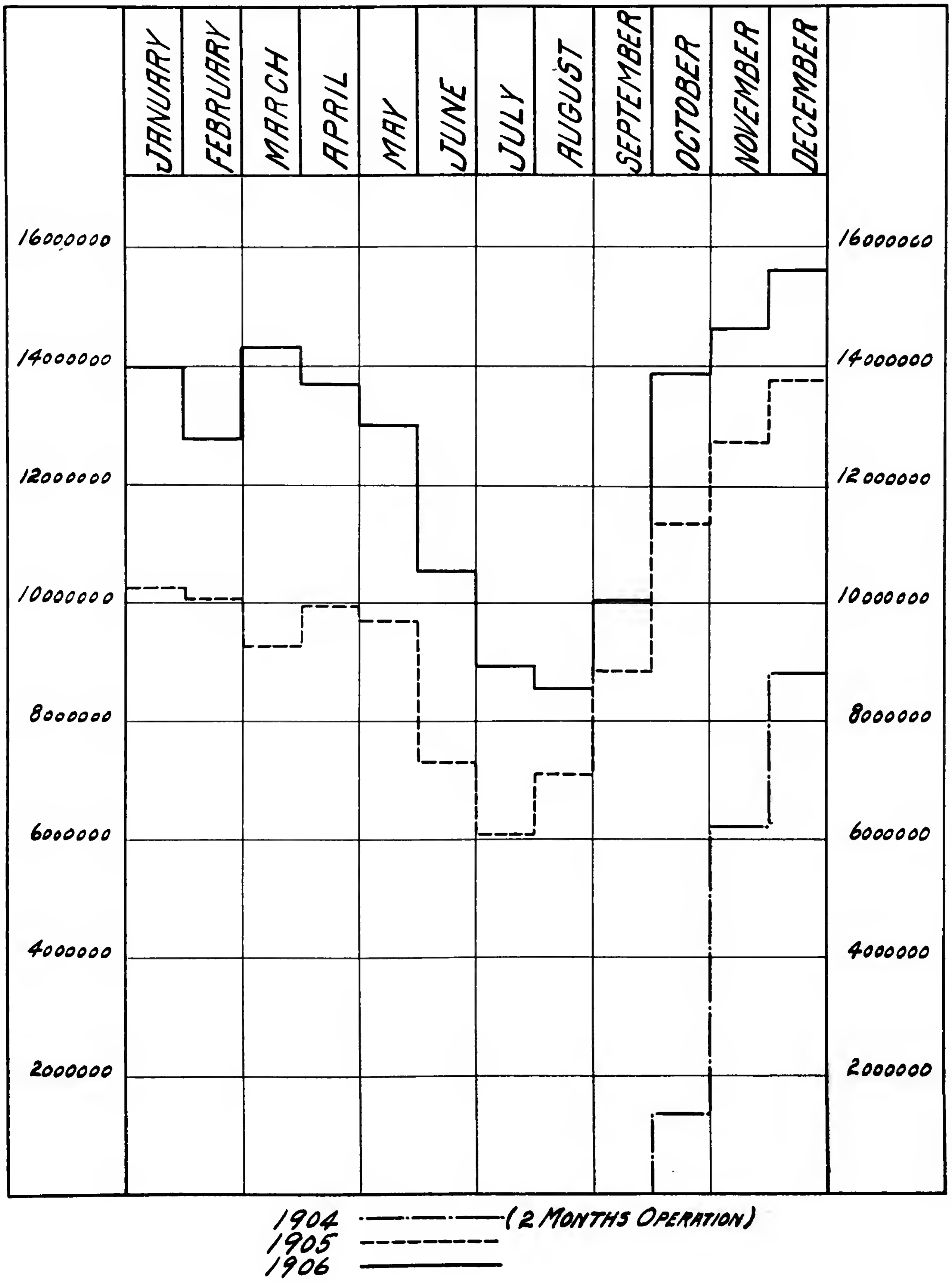
CHIEF ENGINEER

CHART B

PASSENGER TRAFFIC

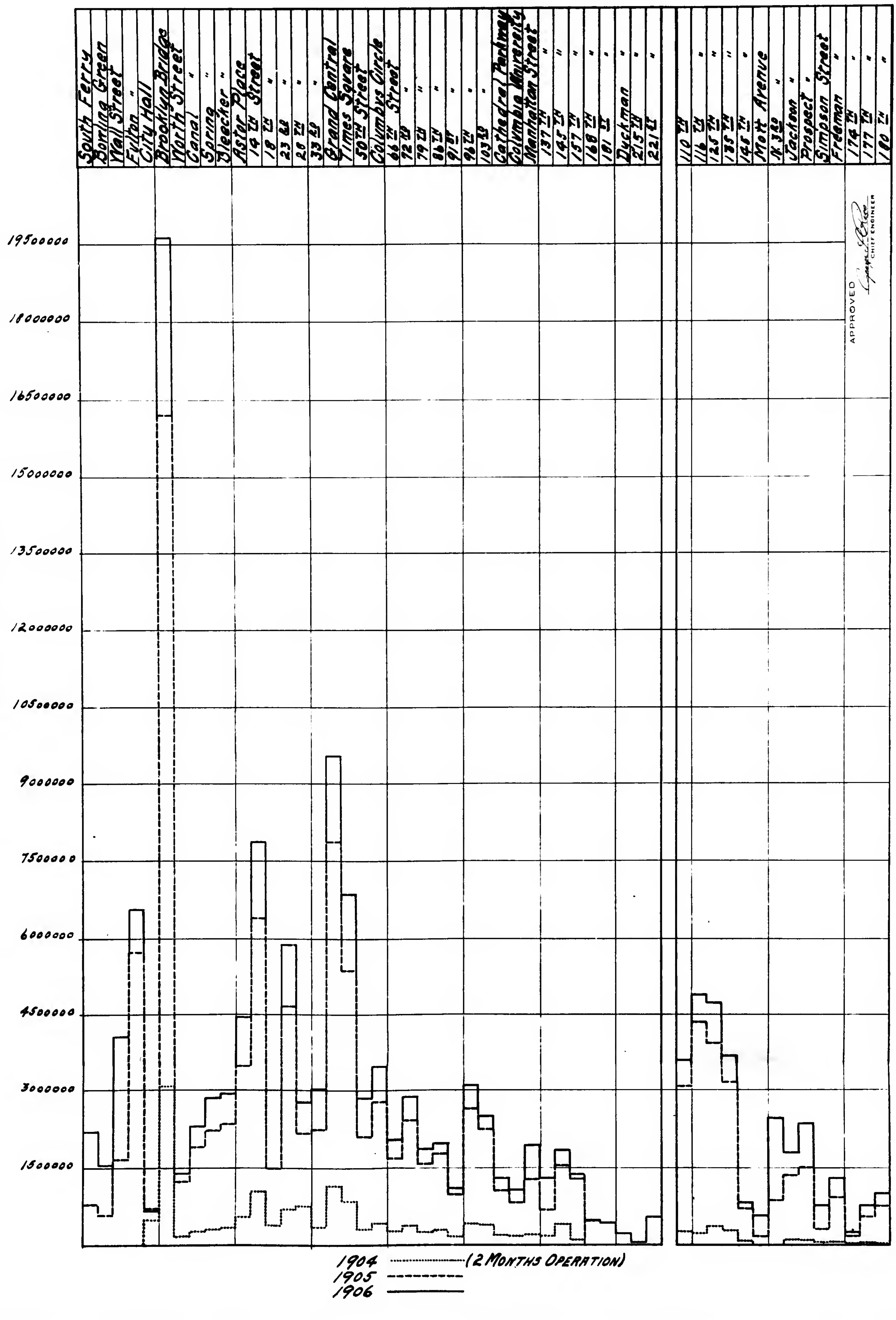
MONTHLY TOTAL VARIATION CHART FOR 1904-5-6



APPROVED
George S. Rice
CHIEF ENGINEER

YEARLY TOTAL PASSENGER VARIATION CHART FOR STATIONS FOR 1904-5-6

CHART C

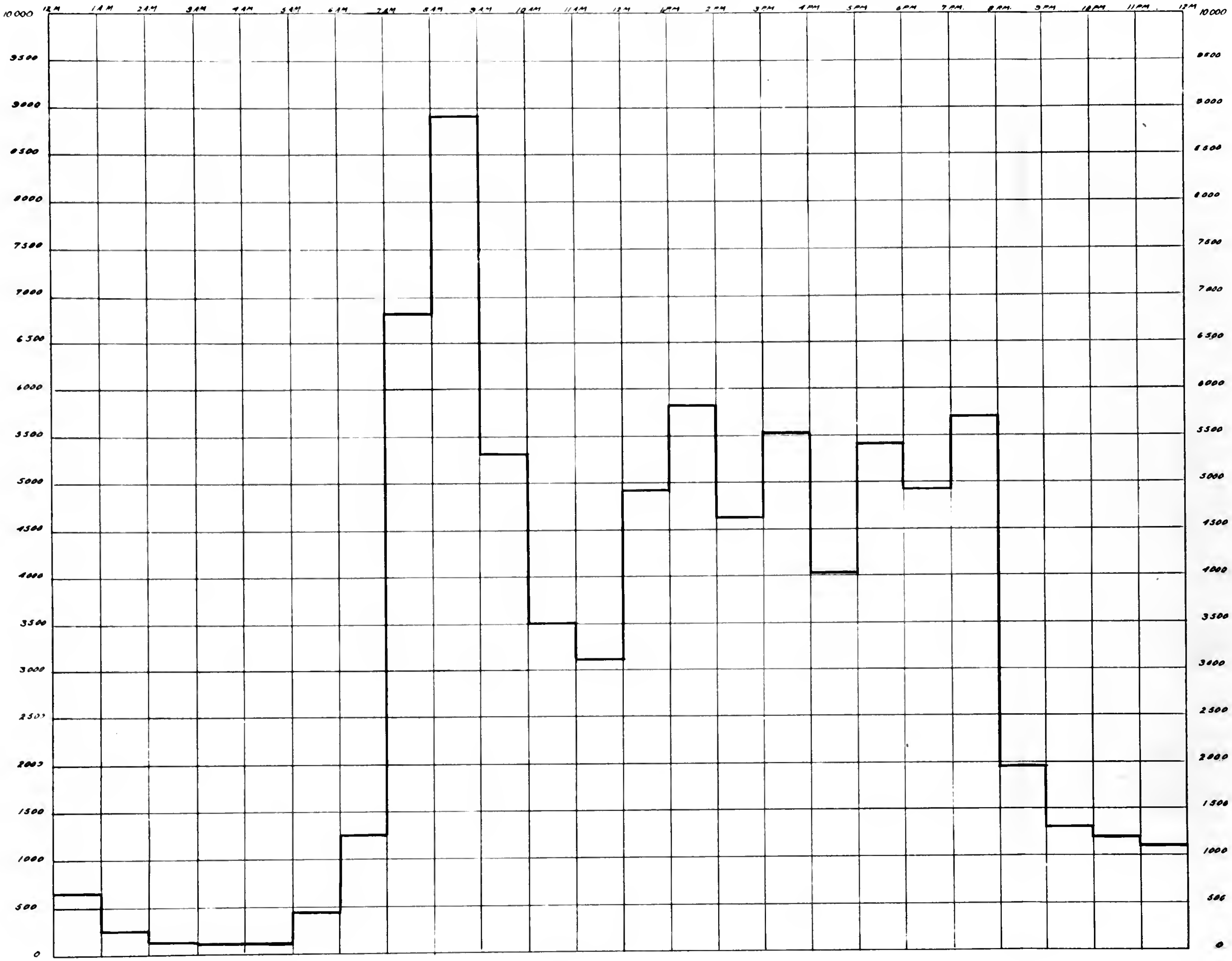


Digitized by Microsoft®

CHART-D

HOURLY TICKET SALES AT BROOKLYN BRIDGE STATION ON DECEMBER 8TH 1906

TOTAL NUMBER SALES 76817



APPROVED
George S. Rice
CHIEF ENGINEER